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THE STREET RAILWAY CONVENTION.

The seventeenth annual convention of the American Street Railway Association, which was held in Boston September 6-9, exemplified again the rapid development of this industry and the healthy growth of the association. The place was most happily chosen. Boston was the birthplace of the association and the scene of more pioneer work, failures and successes in the electric railroad line than any other place, and its system now is perhaps the most interesting one to be found anywhere. While the papers read at the convention did not treat of any of the fascinating new developments, but were devoted to quite time-worn subjects, although subjects of great importance, the chief interest in the street railway conventions attaches to the exhibits, and these were remarkable for their number and value. The most notable feature of the whole convention was the series of charming entertainments, provided by the Massachusetts Street Railway Association, their efforts in this direction being made easy by the number of places of historical interest and facilities for easy entertainment within easy reach of Boston, and by the large number of ladies attending the convention.

A few of the recent developments in street railway development were noticeable in the exhibits. Particular interest was displayed in the running gear of double-truck cars, and the most advanced examples of this part of a railway equipment showed close resemblance to the standards of steam railroad construction, in the use of swing bolsters, series springs and in the general arrangement of the brake rigging and details, combined with the feature peculiar to electric car service—namely, maximum-traction construction, the use of which is becoming almost universal in double-truck electric railway work. The term "maximum traction" is applied to trucks in which but one motor per truck is used and in which the weight upon the motor-driven pair of wheels is greater than that upon the idle pair. As a rule the driving wheels are larger than the others, although this is not always the case. The unequal distribution of the weight is obtained either by overhanging the motor from the driving wheel end of the truck or by placing the bolster nearer that end, or by a combination of these two methods. The purpose of this arrangement is to obtain increased tractive effort, 50 per cent. of the weight of the car apparently being generally considered insufficient for the needs of street railway work, although such cars are ordinarily run without trailers, and this percentage is much higher than that considered necessary in steam railway work. A disadvantage of the maximum-traction truck is the fact that its use largely does away with one of the chief advantages of double trucks over single trucks—namely, the reduction of the weight per wheel and the consequent reduction of rail pounding, wear and tear and the increase of comfort to passengers. The chief advantage of maximum-traction double-truck cars, therefore, over single-truck cars is the greatly shortened wheel base and consequent ability of the truck to take sharp curves without grinding. A general comparison of the advantages and disadvantages of single and double-truck cars was well brought out at the convention in the paper of Mr. Richard McCulloch, which is briefly abstracted in another column. The conclusion of this paper is that double-truck cars are advantageous where the runs are long, the

speed is high and stops are comparatively infrequent, while the single-truck car is more suitable for short runs, dense traffic, many stops and low speed. Two disadvantages of the double-truck car often felt in city service and not noticed in this paper are the inability of the conductor to keep track of the large number of passengers carried, and, therefore, to collect his fares, and the more frequent stops of the larger car, owing to the larger number of passengers carried, and the consequently reduced speed.

Convertible cars—that is, cars which can be opened for summer use and closed for winter use—would fill a long-felt want if a satisfactory type could be obtained. Two attempts at a solution of this difficult problem were shown at the convention and excited much interest. Both cars were constructed with panel side walls, parts of which could be slid or rolled into the roof. One was practically cylindrical, the glass windows being curved in such a way that the whole side of the car could be rolled around into the curved roof of the car. The side panels of the other were arranged in leaves, which could be stowed away in the roof one over the other without cutting off the monitor. Both cars, however, required an aisle down the centre, giving room for only four seats across the car, instead of five, as in standard open car work. In winter, too, it might be feared that the construction would give a very cold and draughty car.

In the electrical part of car equipments a most remarkable uniformity has come about in line with the general uniformity and standardization of electric railway systems, which is, although this industry is of more recent growth, much more marked than that of electric lighting systems. Four-pole motor construction, with windings on all poles, cylindrical steel shells, laminated polar projections bolted in, two-path armatures, barrel windings, high density in the armature core under the slots, are features that are now almost universal. The two forms of suspensions, cradle and nose, are about equally in favor. The controllers made by different companies also bear a wonderful resemblance to each other. All use a magnetic blow-out and the differences between them are more due to patent limitations than to engineering preferences. The extremely close uniformity of electric railway apparatus is one of the most remarkable features of this suddenly developed industry, the exacting conditions of which apparently allow in any line no two solutions of the same problem.

AUTOMOBILES.

For weeks past the French technical press has been filled with accounts of a recent exhibition and contest of motor-driven vehicles, among which those operated by electricity particularly distinguish themselves. It appears that the automobile is peculiarly French, having been carried to further development and being in more general use in France than elsewhere, and that the pastime of "automobilism" will soon become a national one with the people there. This is all as it should be, the only trouble being that so far the interest in automobiles is restricted largely to France.

It is true that they have good roads in France, and to some extent the existence of these may have to do with the passion for "motoring" which exists among our Gallic neighbors to-day. Here we might find it profitable to develop the sport of motor-riding if for nothing else than the influence it would have for the betterment of roads. The bicycle has already made itself a very potent factor for the improvement of rural highways, but it is likely that the automobile vehicle would have an even larger effect for good, especially if vehicles of this sort are not restricted to pleasure carriages, but are built for utilitarian purposes as well. Very few appreciate the enormous importance of the transportation factor in the cost of living, or how much it costs to transport goods or persons on an ordinary country road. A ton of coal can be carried from Chicago to New York for less than it costs to haul it 5 miles on a highway. This is due in part to the badness of the highways, and in part to the high cost of horse traction. The latter is not entirely on account of any inherent difficulty with the horse, but because of the necessity for a man to look after him. One horse hauling 1 ton costs as much for superintendence as would a motor of 50 horse-power hauling 50 tons. Even if horse-power from the horse were as cheap as horse-power from the motor, which it is not, the above fact would place the animal at a great disadvantage.

One of the problems that confront all cities as they increase in size is adequate means of bringing in produce. In the greater part of the United States it costs the producer living 5 miles from the railroad and 50 miles from the city as much or more to haul his goods to the railroad as it does to have them transported to the city from his station. As it is perfectly evident that the light railway, electrically driven, will afford comparatively low-cost transportation only in districts fairly well settled, or where there is a considerable volume of produce to handle, it seems that to some form of the automobile and to better roads we must look for relief from the high cost of horse transportation of the necessities of life. Consequently we should hail the coming of the automobile, in whatever form, with satisfaction, and apply our energies to its betterment. It is true that so far motor vehicles are mostly pleasure carriages with a few timid delivery wagons feeling their way about the streets, but it is likely that the first savage who tamed a horse used him for show and that it took some time to reduce him to be a bearer of burdens.

Convention of the Association of Edison Illuminating Companies.

This association is holding its annual meeting during the present week at Sault Ste. Marie, Mich., commencing on Monday and continuing until Wednesday. Papers on the following-named subjects are down on the programme: "Methods of Charging"; "Developments in Transmission Apparatus"; "Meters"; "What We Saw Abroad," a partial report of the observations of Messrs. J. W. Lieb, Jr.; J. Van Vleck and Arthur Williams, all of the Edison Electric Illuminating Company, of New York, and who are now in Europe studying recent developments in electric science and practice; "Problems of Smaller Stations"; "Report of Lamp-Testing Bureau, Including Report of Tests of Non-Edison Lamps."

Meeting of the Old-Time Telegraphers.

During the present week, on September 13, 14 and 15, the Old-Time Telegraphers' Association and the United States Military Telegraph Corps will hold their joint annual meeting in Omaha. The business session of the Old-Time Telegraphers will be called at 9:30 on Tuesday morning in the Bee Building, and on Wednesday morning the United States Military Telegraph Corps will hold its business meeting at the same place. An extensive entertainment programme has been arranged for the members of the two associations and their friends. There will be tally-ho rides around the city; excursions to the exposition; and visits to the different points of interest in and about the city. A novel feature of the entertainment will be a special war-dance by the Indians encamped on the North Tract. Another interesting feature will be the ascension of a war balloon with telegraph and telephone apparatus. At 7 P. M. on Thursday a banquet will be held at the Markel Café on the exposition grounds.

Inspection and Testing of Motors and Car Equipments by Street Railway Companies.*

BY F. B. PERKINS.

In no direction can a railway company save money or increase dividends more rapidly than by having its equipments thoroughly inspected by competent men, working systematically under intelligent direction. Instead of examining cars once in thirty or sixty days a daily inspection is necessary. I have thought it expedient for the purpose of setting forth my views on inspection to describe the work as being carried on in a modern car house containing fifty equipments, and arranged for the easy handling of the cars, so that no extra help will be required for that purpose.

In dealing with the inspection of cars in this car house we believe better results can be obtained by giving to each man some particular branch of the work, rather than assigning to him a certain number of cars and expecting him to do all the work required thereon.

Two men would be required to grease and inspect the motors; one to keep the controllers in repair, one to take care of the trolleys and to assist in the care of trucks and car bodies, one to have charge of the trucks and car bodies.

The most vital parts of the equipments are the different parts of the motor, viz.: armatures, fields, bearings, brushes and brush holders. The care of this part of the equipments should come under the head of greasing, and on the manner in which this part of the work is done depends to a large extent the frequency with which the cars will break down while in service, and also the amount of repair necessary to keep them in operation. Oftentimes the most ignorant and cheapest men are given the place of greaser. On the contrary it is a position where intelligence and thoroughness are imperative.

The car should pass into the greaser's hands the first day after it is on the road and every second day thereafter. He should examine thoroughly brushes, brush holders, gears, pinions, bearings and commutator. Of these parts, the care of the bearings and commutator is the most important, and should therefore receive the greatest amount of attention. The manner of caring for the bearings is very simple. They must be well supplied with grease or oil, and care must be taken that they are kept free from dust and grit, and also that the grease feeds properly.

In the matter of the care of commutators, electricians seem divided in their opinion as to whether they should be sand papered or not; personally I am not in favor of it. Instead of temporizing the commutator by sand papering it, and thereby simply putting it in shape for one more day's work, I would get at the bottom of the trouble, and either make a commutator, by some preparation of mica and copper, which will not spark, or if the trouble lies deeper remedy it by remodeling the entire motor. This may seem to be a heroic measure, but the end will justify the means. I think, however, that usually the trouble is not in the commutator, nor with the motor, but in either the brushes or brush holder, or both, and it is probable that with proper adjustment and with proper care and treatment we should find the trouble obviated and sand papering of commutators unnecessary. When speaking of the treatment of brushes I refer to a treatment of oil or something similar.

The writer has personal knowledge of a large road where common brushes were used without any treatment or care except to replace them as needed, and it seemed as if the man who used the most brushes was given the credit of taking the best care of his motor. The average life of brushes on this road and the above conditions with the commutator sand papered every day was six days. Subsequently the sand papering was stopped entirely, and the brushes were removed every six days and properly treated in oil. The life of brushes under this treatment was increased from six days to from forty to sixty days. The trouble with commutators, which before had been great, was reduced to a minimum, in fact almost entirely averted. It is possible that under some heavy conditions the practice of sand papering must be kept up, but it must be accomplished in a different manner, and, instead of indiscriminate sand paper, it must be applied sparingly.

Not later than every fourth day every controller and switch should come under the notice of the man who has charge of these parts. The main point is to clean thoroughly, using a little vaseline on the contacts. The parts that are worn should be touched up with a file, or should be sand papered, and if badly worn should be replaced, so that at least every fourth day the controllers will be sent out in first-class condition. This man can also examine the car wiring, lamp fixtures, headlight and all similar parts.

The fourth man should have the care of the trolley poles and wheels. These should be carefully looked over each night and oiled if necessary. The man who attends to this part of the equipment will also have considerable time to devote to general inspection of the car bodies and trucks under the direction of the general inspector. Under the scrutiny of these two men should come all the details of the car body, such as grab handles, window catchers, curtain fixtures and similar parts. These should be carefully attended to each day, insomuch as the reputation of the road will suffer in direct proportion as the attention to these small details is neglected.

After having touched upon the subject of the matter of inspection in the car house we have to deal with outside inspection, that is, inspection on the road by inspectors, motormen and conductors. It may be a good plan to have outside inspection, and it is often advantageous if not carried too far, but I do not believe it is desirable to have a large force, for this reason: but very little of the time devoted to this line of inspection is really used in looking over the equipments, but must necessarily be consumed in getting from one car to another and in waiting for opportunities, and most of the trouble located by these inspectors is not of such a nature as to require immediate attention. If it were the inspector could not make the necessary repairs without taking the car to the car house.

Troubles of a serious nature, such as would require immediate attention and taking the car out of service, should be easily detected by the motorman or conductor, and reported at once to the proper official. It may not be entirely irrelevant to speak here of the relation of motormen and conductors to the inspection of cars. It has been proven that it is usually a waste of time, and very little has been accomplished by attempting to instruct motormen and conductors in other than the simplest ideas of electrical problems; for while on some roads there may be a number of old motormen who have a fair idea of electrical equipments, and whom it would probably be safe to allow to locate existing trouble, it would be difficult to draw the line between the men competent in this direction and those wholly lacking in such knowledge.

Next comes the matter of testing. The service which we will obtain from our equipments depends largely upon the manner in which the repairs are made. If the repair work be rushed through with the idea of going over as many cars as possible in a short space of time and with little or no regard for the thoroughness of the work we must expect the necessity for repairs to increase to an alarming extent. If, on the other hand, we make our repairs with the idea that work thoroughly done will have a tendency to greatly decrease the liability to breakdowns while the cars are in service, and correspondingly reduce the amount of work to be done in the repair shops, we shall naturally consider the best means not only of doing the work, but of definitely determining its condition when finished. To do this properly we must resort to our testing, and we use the word "testing" in a broader sense than it usually signifies. For example, all material furnished, such as tape, mica, paper, etc., must be kept up to the standard, and to accomplish this everything used should be carefully examined, or, under our classification, tested.

We must begin testing in the purchasing department. In the purchasing of supplies a great deal of trouble is often occasioned by changing the kind of material furnished. This is probably more noticeable in the case of small roads. Now, while there may be no great difference in the quality of goods furnished, or if any one of the many different kinds were used exclusively, it would give satisfaction, yet the very fact that many different kinds are used has a tendency to produce a lack of care in the details of the work which will almost invariably show in the general result.

If, however, we have to allow only one kind of material in the repair shop the question naturally arises as to how we can avoid being behind the times in the matter of different kinds of supplies, and also in the manner of their use. The answer is we must have an experimental room, and there must be tested samples of all supplies and material before being contracted for by the purchasing agent.

Having now provided for our testing department and established

*Paper read before the American Street Railway Association, Boston, September, 1898. Abstracted.

its relation to the purchasing of supplies and to the employees of the repair shop what machines and instruments shall we need in its equipment?

A high and low reading direct-current voltmeter, one having a double scale reading from 1 to 750 and from 1 to 15.

A direct current ammeter reading from 1 to 100.

A low reading ammeter would be very convenient many times, but is not absolutely necessary.

A 50,000-ohm magneto bell.

An alternating current voltmeter and some handy testing set will make an outfit of instruments with which we can do all the testing required.

If the alternating current is not within reach of the car house we must procure a small dynamo. A very small machine, say 2 horse-power, would be sufficient for all the needs of the testing department. If this machine is designed for about 100 volts it would be most convenient for our use. With a few small transformers wound for 2000 volts primary and for either 50 or 100 volts secondary, we are prepared to furnish any voltage within a range of from 5000 to 10,000 volts.

The man who has this part of the work in charge can very easily and cheaply arrange the details of installation of the wiring, etc. He can also make some resistance coils and many other pieces of apparatus which will greatly facilitate the quick testing of whatever may be sent to this department.

What shall we test? First, everything that goes into the repair shop. By doing this we shall be sure of keeping all material up to the standard, which means an absolute guarantee against breakdowns caused by poor material. In this way we raise the standard of workmanship.

Second, all supplies which go to the foreman of the car houses. In connection with this matter we are of the opinion that in the testing room should be decided the manner of treating brushes, the length of time they should be used before being removed from the motor, the manner in which they should then be cared for, their final disposition, the proper attention to be given the trolley poles, the length of time they ought to remain in service, their condition when removed, and many other similar questions should not be left to work out their own solution or be dependent upon the feelings or judgment of the various employees and workmen, but should be definitely determined and decided in our testing department.

Many may be of the opinion that we are carrying system beyond necessary limits in thus definitely and positively arranging these details, but why should we allow several different men to use material in whatever manner they may individually see fit, to treat brushes as their fancy may dictate, to regulate the tension of trolley poles in accordance with their own feeling at the time rather than by any fixed standard, and various other matters which might be mentioned along these lines.

Third, all finished material, such as armature coils, insulation for controllers, commutators and brush holders. We do not necessarily need to test every piece, but enough to satisfy ourselves that the general order of work is kept up to the standard.

Fourth, all armatures, fields, commutators and controllers, as they are being made or repaired. One illustration will be sufficient to show how the testing may be carried on in this branch of work.

An armature is wound and ready to be connected to the commutator. With a small wire we connect all of the top leads together, with the bottom leads each separate from the other. With a magneto or testing set we find the insulation of the complete armature is not right. First, we cut the small connecting wire on the top leads in several places, then by testing each of these parts we locate that portion of the armature which is bad; then, by removing the wire we will test each coil separately until we find the weak one. Next, by the use of our transformers we obtain 3000 or 4000 volts, which we apply to this one coil. If it stands the test we may allow it to go through, and if not it can be replaced. If we should find that the trouble extended to a large portion of the armature and indicated moisture in the coils we may by the use of this same transformer obtain 25 or 30 volts, and by connecting the armature to the commutator with the exception of one end of one coil, then connecting one side of the 25-volt circuit to this end, and the other side of the circuit to the commutator bar left vacant, we may apply the current for the purpose of drying the armature. With this arrangement the heat will be generated in the coils, and the armature will dry from the inside instead of from the outside.

The Equipment and Maintenance of Electric Cars.*

BY M. S. HOPKINS.

CAR BODIES.

For years car builders have attempted to devise a car body which would be equally durable in both summer and winter, but judging from the character of equipment now in use on the majority of roads such a car has not yet been produced. The combination car with movable parts is not satisfactory for winter use, is troublesome, noisy and cold, and is lacking in many of the essential features of the open car for summer service. The open cross seat car of the barge type with running boards on the side seems by far the most desirable type of car for summer service, offering the largest seating capacity and the best facilities for receiving and discharging passengers, which is a great advantage in city service. Considering all features, the box car with side seats, large windows, wide end door to the side of a roomy platform and vestibules closed on one side, seems best adapted to the average conditions of winter service.

The long car body seems to be growing in favor with the railway manager, due to the comparatively small increase in operating expenses, in comparison to increased carrying capacity, and its allowing of the increase of headway or decrease in number of cars run, resulting in a large decrease in operating expense per passenger carried.

TRUCKS.

Under the average conditions a 22-foot closed car or eight reversible seat open car body should be the limit for a single truck. Although there are single trucks which will carry a longer body fairly well, yet the increase in maintenance will in most cases warrant the use of double trucks. The local conditions should govern the type of double truck used, the bolster type in most cases being preferable for long cars on high speed, suburban service, while for city service, where heavy grades and quick starts demand maximum traction, and short curves make it necessary for the wheel to turn under sill, the bicycle type must necessarily be used. This type of truck is no longer an experiment, and while they possibly require more careful inspection and adjustment very efficient service can be secured from trucks of this type.

Trucks should be made up of a small number of parts; cast and malleable pieces should be the lightest consistent with strength. Springs should be so arranged as to prevent oscillation, and give an easy riding car under all conditions from no load to full load, and when style of truck is of such design as to prevent the use of an under truss, spring base must be exceptionally long and end springs so arranged as to relieve strain on car sill.

ELECTRICAL EQUIPMENT.

In the selection of electrical equipment the main point is to secure equipment of ample capacity and proper design for service required. In a railway motor, the mechanical and electrical features which influence its maintenance should receive very careful consideration. The bearings should be large and lubricated by oil from below and cup grease from above, and so designed that drip from bearings will fall outside of frame; the armature so constructed as to permit shaft being pushed out without disturbing commutator and winding.

I am glad to note that the importance of light weight and slow peripheral speed of armature has been recognized in recent design of railway motors. The inertia or flywheel capacity of armature should be the smallest possible consistent with the work required. Engineers differ as to the best method of suspension. From a theoretical standpoint, the cradle or side bar suspension has the lead. The dead weight is largely removed from axle, thereby eliminating to some extent the hammer blow on rail-joints, decreasing the wear on axle brasses and securing the better alignment of gears; yet, in practice, the nose suspension is still preferred by the writer, as the car starts more smoothly—the weight of motor on spring supports overcoming the jerk and quiver so common in other methods of support. The specifications for railway motors as drawn up by leading manufacturers of to-day amount to practically nothing, and would suggest that the purchaser of motors in his specifications clearly define the rating, heat limit and efficiency.

The series parallel controller is in most respects a satisfactory device, the chief objection being the narrow range of speed on running notches. Specifications for resistance should provide that the last two points of resistance be of sufficient capacity to allow of their

*Paper read before the American Street Railway Association, Boston, September, 1898. Abstracted.

continued use as running notches, especially where cars are operated in city service.

There are several types of magazine fuse boxes or cut-outs and single cut-outs using a special fuse which possesses a number of points of merit. Without going into detail, it is the opinion of the writer that, under average conditions, the standard magnetic blow-out fuse box, using a link fuse, is preferable.

Each car should be equipped with a thoroughly reliable lightning arrester. Points to be noted in selecting this device are as follows: The kicking coil should always be installed; the air gap should be as small as possible; a positive and quick device for interrupting the current after discharge, and which will not be injured by discharge; a non-inductive resistance in circuit which will limit the flow of current and thereby prevent the opening of circuit breaker at station when several arresters operate at the same time.

MAINTENANCE OF EQUIPMENT.

The cost of maintaining equipment depends on various complex conditions, some of which are beyond control of the manager, and others for which he should be directly responsible. Heavy grades, numerous railway crossings, sharp curves, dirty and unpaved streets, imperfect and poorly constructed equipment, long and severe winters—all affect cost of maintenance unfavorably and are beyond control of the manager. But the character of the men who operate the cars, the manner of operation, the way in which repairs are made, and the character of men engaged in repairs, and the material used, are the controllable elements and in most instances the chief features affecting cost of maintenance.

CARE OF EQUIPMENT IN CAR HOUSES.

Generally one of the following three methods are used for daily inspection of our equipment, namely: inspection of cars each trip; inspection of equipment at night by motor inspectors; and inspection of equipment during the day by motor inspectors and repair men.

In regard to the first case, that of the trip inspection, I would say that in the present degree of perfection attained by manufacturers of railway equipment trip inspection should not be necessary, and excepting in interurban lines operating at high speed over long runs is of doubtful value. It is expensive, requiring the services of an inspector who is necessarily a man of some ability for each line of cars. The period of time for making this inspection is necessarily very short, and the entire time is taken up in mere inspection—little or no opportunity being afforded in which to make repairs.

In regard to night inspection, the experience of the writer has been such as to absolutely condemn such a method as expensive, slovenly and unsatisfactory. It is impossible to make a thorough inspection of cars at night, no matter how well lighted the car house may be, and the efficiency of the work done by the men is very far below that of the work during the day. Therefore, when local conditions will admit, inspection of cars during the day seems by far the most advantageous.

For making inspection and running repairs such as should be made in car houses, it is a safe rule to have one man to seven cars. It is, however, important to have a man in all car stations, known as chief inspector of that division, who is thoroughly conversant with practical electrical and mechanical matters.

Bearings should be run "close" at all times, the time of their renewal being determined by the effect of the wear on the gear and pinion, as the wear on these parts is largely affected by the wear of the bearings.

After a series of tests covering quite a period of time, as to the wear of various materials used in motor bearings, the writer feels warranted in making the statement that either the best grade of babbitt or brass bearings should under the ordinary condition give a longer life than six months, and when a bronze bearing of the proper mixture is used and properly lubricated a life of twelve months can safely be expected. The method of lubrication largely influences the life of brasses. The writer has, after long tests with various lubricants, discontinued the use of grease entirely on armature brasses, and in most cases on axle brasses, a good grade of engine oil, supplied through wicks, being more satisfactory and economical.

In order to reduce the maintenance of brasses to a minimum the use of phosphor bronze is strongly recommended. Street railways operating twenty-five or more cars will find it economical to cast and machine their own brasses. This may be discouraging to the supply men, but it means money on the right side of the ledger when the expenses are footed up. A small brass furnace can be cheaply erected, and after suitable jigs which can be attached to any lathe have been provided for boring and turning the cost of casting and boring is very little more than the cost of re-babbitting, especially where babbitted brasses are machined after boring, while the life of the bronze bearing is far in excess of that of any babbitt yet tried.

Rough and burnt commutators are too frequently the cause of expensive motor repairs and usually indicate imperfect motor design or inexcusable neglect. Well designed motors in good condition, even under the hardest service, provided, of course, the average work is within the rated capacity of the motor, should not require turning oftener than once in eight months. There is nothing that so well indicates to the practical man the condition of the motor as the condition of the commutator. Whenever the commutator shows signs of burning or blackening, steps should be at once taken to prevent it. It is not advisable to try to prevent this by the continual sanding of commutator by motor inspectors, though the occasional cleaning up of the commutator with sandpaper is necessary with all motors. The causes of trouble of this character are so numerous that mention is made of only a few of the more important.

The kind of brush used is an important factor. Brushes should be soft, close-grained carbon treated with a good lubricating compound—one which does not flow too freely from the heat from the motor, and which will not burn and carbonize on commutator. The price of brush is not a material consideration, as a brush which is slightly superior to another will prove economical even at quite a large increase in first cost. The tension on the brushes is as a rule too light on railway motors. It is a common belief that heavy tension causes wear of commutator, but experience has shown that the actual wear of commutator due to friction of the brush is very small, and that increased tension will in some cases materially decrease the sparking which causes the greatest wear. Improper alignment of brush-holders frequently causes sparking. In recent practice the use of side contact springs on brushes has been generally abandoned. On motors carrying heavy currents this spring is quite essential, as excessive heating of brush is caused by limited contact in the holder.

Commutator insulation should be made of what is known as the build up mica segments of the very softest grade of amber mica. A hard, clear mica should never be used in commutator, as this mica will not wear away as fast as the copper and there is nothing so disastrous to the life of the commutator as high mica insulation.

In some motors it may be necessary to change the winding of armature and field coils in order to avoid the burning of the commutator. First, determine by actual experiment what change in winding is necessary, and then equip with the new winding every armature or field that comes in burned out. This will permit of change being made without any great expense, as the greatest part will be borne by the maintenance charge.

THE ELECTRICAL TESTING OF RAILWAY EQUIPMENT.

Elaborate systems for the periodical testing of insulation on railway equipment seem to be growing in favor with some electrical engineers, but the practical value of these elaborate tests is not fully demonstrated. Experience has shown that tests of this kind are very misleading and frequently cause the tearing down of equipment which under ordinary conditions, had no tests been made, would have continued in service for a long time.

Judging from my own experience, it is neither necessary nor advisable to periodically test the insulation on the equipment, but to make such tests only in cases where motors are not working properly. The proper training of motor inspectors as to the little points about railway equipment which clearly indicate trouble with motor will in nearly all cases locate trouble due to weak insulation so that it can be remedied before any serious damage has resulted to any other part of the equipment.

All armature and field coils repaired should be carefully tested as to resistance and insulation to ground, and on all armatures having coils repaired, new commutator put on or commutator turned, resistance between commutator bars should be very carefully measured; using preferably a portable Wheatstone bridge testing-set, capable of showing clearly a variation in resistance of 1-1000 of an ohm. This is one of the most important tests to be made in the care of railway equipment, as more burn-outs of armatures are caused by the slight short circuiting coils, due to solder, acids or copper turnings bridging over insulation between bars under leads, than from any other cause, which can only be located by a test of this kind. Any mistake in connecting up the leads or a bad joint will at once be detected before any damage has been done. For testing insulation to ground, I consider a first-class magneto of 10,000 ohms resistance all that is necessary.

CONVENTION OF THE AMERICAN STREET RAILWAY ASSOCIATION

No fault could be found with the choice of a location for the street-railway convention of 1898. Boston for this purpose proved ideal. The building of the Massachusetts Charitable Mechanics Association provided an admirable convention chamber, an excellent amphitheatre just large enough to hold the exhibits without overcrowding and without appearing too large, and admirable facilities for the evening entertainment. The attendance was large and the interest shown, especially in the exhibits, was enthusiastic. The exhibits were unusually complete and interesting, in spite of the fact that there were shown but few of the real novelties recently brought out by the introduction of electric traction into larger fields than street-railway practice. The most prominent company in electrical construction work made this year a rather disappointing exhibit. Instead of showing as customarily its newest and best it erected a spectacular non-electrical display, better suited for a popular fair than for the gathering of technical men who could appreciate its engineering work, and depended on Boston installations for its technical display. Rival companies, however, more than made up for this deficiency in the exhibit hall.

TUESDAY, SEPTEMBER 6.

President A. E. Lang called the meeting to order at 11 A. M., in Paul Revere Hall, and introduced Mayor Josiah Quincy, of Boston, who delivered an address of welcome, outlining the advance of modern civilization and showing the importance to this advance of the development of improved means of transportation.

After thanking Mayor Quincy for his cordial welcome President Lang announced that the roll would be considered called by the registration at the door, and the minutes of the last meeting would be considered approved unless some objection were made to them as printed. Several new companies were admitted to membership.

The action of the Executive Committee since the last meeting of the association was approved by resolution and the president then read his annual address. In this he traced the history of the association from its inception, commending the work of its founders in the constitution and touching briefly and entertainingly on the various meetings. Coming down to the present, he stated that the association had now reached home, not only the birthplace of the association, but the home of the electrical industries in a larger sense perhaps than any other locality in the world. The people of Boston not only furnished money with a lavish hand to carry forward the work of electrical development, but also much of the brains and energy needed to make its use practical. After thanking the technical press, the supply men and the Executive Committee for their efforts on behalf of the work of the association, President Lang suggested a few subjects suitable for future papers and discussion. In closing he called attention to the convention of the Street Railway Accountants' Association occurring simultaneously in another part of the same building, and thanked the secretary and the Executive Committee for their work and the association for the honor of being called to the office of president.

A vote of thanks was tendered to the mayor of Boston for his welcome, following which the report of the Executive Committee was read by the secretary and approved. The secretary and treasurer's report showed the financial condition of the association to be as follows:

Balance, October 18, 1897	$2,931.48
Receipts	6,376.17
	$9,307.65
Expenses	5,651.37
Balance, September 5, 1898	$3,656.28

Mr. Richard McCulloch then read his paper, entitled "Comparative Earnings and Economy of Operation Between Single and Double Truck Cars for City Use." The purpose of the double truck car enabling the use of a longer car body was pointed out, the wheel base of a single truck being customarily limited to 7 feet in order to round curves without serious binding. This, with a 20-foot body and 4 foot platforms, gives an overhang of over 10 feet, which is about as great as can be used without rocking uncomfortable to passengers and disastrous to car and track. The question involved the comparative advantages of long and short cars, and on account of the customary use of cross seats in longer cars the relative advantages of longitudinal and cross seats were also involved. The beneficial results of larger units and fewer of them were shown to be largely due to the reduced cost per passenger of the wages of conductors and motormen. The disadvantage of increasing the headway of small roads where it is already long was pointed out, and a careful comparative analysis of the relative advantages of single truck cars with trailers and double truck cars without trailers was worked out with data derived from actual service tests on the author's road. The cost per passenger of wear and tear on trucks and motors and of power required was shown by these tests to be about the same with either style of truck. The recent improvements in lowering the sills of double truck cars and the preference of passengers for these more comfortable vehicles were also pointed out. The general conclusion was that the double truck car is more suitable for long hauls, high speed, pleasure travel and lines competing with other systems, while the single truck car is more suitable for dense traffic, many stops and low speed.

In the discussion Mr. Beggs, of Milwaukee, described the use of double truck cars in that city and spoke most favorably of them, stating that the single truck cars on his line have been allowed to wear out and be scrapped and replaced by double truck cars instead of repaired and kept in service. In answer to a question asked by Mr. Sloan, of Chicago, as to double truck cars with four motor equipments, Mr. Beggs stated that the line between Milwaukee and Waukesha Beach, 26 miles in length, had been equipped with double truck cars weighing 35,000 pounds, fitted with four G. E. 1000 motors geared to make 26 miles per hour. The improved action on heavy loads and in times of bad weather is so pronounced that Mr. Beggs considers that it may be advisable to equip all double truck cars with four motors.

Following the discussion it was suggested that the members of the association who were present at the organization in Boston in 1882 should rise. Messrs. W. W. Bean, of St. Joseph, Mich.; George B. Kerper, of Dayton, Ohio, and Julius E. Rugg, of Boston, complied with this suggestion, after which the meeting adjourned.

In the afternooon the first entertainment provided by the Massachusetts Charitable Mechanics Association was carried out in a trip to Lexington and Concord. On Lexington Common a description of the historic events of the Revolutionary War which took place at that point was given by the historian of the Lexington Historical Society. After a hasty visit to the Hancock House the party proceeded to Concord. The houses once occupied by Longfellow, Emerson and Thoreau were noted, as were many points of Revolutionary interest. In the evening a reception and dance, arranged by the Ladies' Committee of the Massachusetts Street Railway Association, was held in Paul Revere Hall.

WEDNESDAY, SEPTEMBER 7.

The meeting was called to order by President Lang at 10:30 A. M. and the first paper read was that by W. S. Dimmock on "The Carrying of United States Mail Matter on Street Railways." The paper brought out the extreme importance of the saving of time in the distribution and collection of mail matter, which is undoubtedly the most potent argument in favor of the electric car service. As a general thing interferences and delays with electric mail cars have been found to be fewer than with wagons over the same route. Another great advantage of the electric car transmission is the more frequent service obtainable between post offices, depots and substations. The transmission between Omaha and Council Bluffs and Omaha and South Omaha was described in detail by Mr. Dimmock, who is well acquainted with this service, owing to the fact that he is general superintendent of the Omaha & Council Bluffs

Railway & Bridge Company. Before the electrical car service was installed the mails were necessarily carried by wagon from one post office to the railroad, by rail across the river and by wagon again to the other post office. The number of trips per day was much smaller than desirable, owing to the lack of a sufficiently frequent train service. The electric service took the mail from office to office in the same time that was formerly required to take it by wagon to the train. On the subject of compensation for this service, the author of the paper considered it a mistake that the electric railroads counted too much on the protection granted against the interference of strikers and had consequently taken the mails at most any price. The running of one mail car on a steam road gives an opportunity for carrying some twelve or fifteen passenger cars on the same train, which clears up the traffic for some time, but an occasional mail car train on an electric road does not serve to keep the system in anything like satisfactory operation or accommodate more than a very small fraction of the traffic. The result is that electric railroads are carrying mails for the bare cost of giving the service and are not getting the protection which they had hoped for. The present flat rates paid by the Government of 3 cents per mile for pouch service and 16 cents per mile for 16-foot cars is considered too low, and it was suggested that the members use what influence they could toward getting the Government to increase these rates.

In the discussion of this paper, Mr. C. S. Sergeant, of Boston, gave some interesting details of the mail system there in use, from which the following points have been abstracted:

Mail service on the street-car lines began in 1895, with seven mail cars, which we equipped, and which originally made forty-three trips daily.

In 1893 the mileage will be upward of 170,000 miles.

There were originally twelve stations, to which two have been added. Connections have always been made with the Boston & Albany and Providence depots, and the Union station. Sixteen men are constantly employed, eight conductors and eight motormen.

Out of about 45,000 trips run (to January 1, 1898) there were 360 failures or irregularities, or about 8-100ths of 1 per cent., and those were almost wholly due to the snow and the consequent blockading of teams in the narrowest streets.

Seven cars handle 100,000 pieces of mail daily. The system is under the supervision of the New England superintendent of railway mail. In other cities the trolley and cable service is under control of the local postmaster. The General Superintendent of Railway Mail of the United States in his report for 1895 says: "In Boston, by reason of the fact that the street-car lines are all under one management, we are able to move mail from one suburb to another, as, for instance, from North Cambridge and Cambridgeport to Brookline, by direct transit, the mail not being compelled to pass through the main office. There is probably no city in the country where the benefits of this service will be as great as in Boston, with its densely populated suburban districts, all of which have heretofore been more or less restricted in their mail accommodations by reason of their mail having to go through the city post office. By the present system, the railway post offices centering at Boston can "pouch" to the street-car lines all mails for suburban points reached by them; and the street-car lines in turn can gather up all the mail from suburban points and pouch it direct to the departing trains at the various depots.

The first practical illustration of a street-railway post office was in Boston. Other cities had street-railway mail cars first—St. Louis and Brooklyn, where the mail was simply carried in bulk and delivered the same as by wagon, not being worked in transit; but Boston street-railway cars were the first to be patterned after steam railway cars, with racks and all appliances for working the mails in transit—transferring, so to speak, so much working space, and clerks, from the main post office to the post office on wheels, thereby losing absolutely no time in handling matter, and enabling the business man to get his mail early in the morning rather than late in the afternoon, with nearly a whole day saved for him. One car is equipped with an electric canceling machine, with a capacity of 2000 cancellations an hour.

Let us follow a car to North Cambridge, and touching Park Square, Cambridgeport and Cambridge post offices en route. Take the first trip in the morning, where the postal clerk receives from the general office all the accumulations of mail which arrive during the previous evening from all parts of the country. Upon arriving at Park Square station (the train from New York with all mail from the South and New York State arrives at 5:30) this mail is delivered direct to the postal car, and the contents opened by the clerk and assorted for the carriers. Upon the arrival of the car at Cambridgeport, a fifteen-minute run, the mail for that station is about all ready for delivery to the carrier. This also applies to Cambridge and North Cambridge. Now this car receives all mails collected at the various stations and assorts it in the car, inward, for all outgoing trains, so that when it reaches stations en route or Boston the mail is all ready for immediate dispatch.

Each car handles nearly five and a quarter million pieces of mail, or a total of 36,561,170 pieces for the seven cars in a single year.

After a further discussion it was moved and seconded that a committee of five be appointed by the chair to act under the Executive Committee and communicate with the different members of the association and get all the facts before them and keep the association advised of their proceedings, and that they have authority to confer with the post office authorities. The motion was carried.

The next paper was that of Mr. M. S. Hopkins on "The Maintenance and Equipment of Electric Cars for Street Railways," which was read by the secretary. An abstract of this paper will be found in another column.

In the discussion, Mr. H. M. Sloan, of Chicago, stated that on his roads night inspection worked very satisfactorily, and that it was the custom there to change the motor brushes every night, which he stated effected considerable saving on the commutators. The usual practice is to take the entire truck out of service whenever an armature burns out, this frequent inspection giving improved results.

A vote of thanks was tendered to Mr. Hopkins for his paper, after which Mr. W. Caryl Ely, first vice-president of the Street Railway Association of the State of New York, extended an invitation to the members of the National Association to attend the annual convention of the New York State Street Railway Association at Manhattan Beach, Tuesday and Wednesday, September 13 and 14.

Letters were then read inviting the association to meet in various cities next year and other invitations were presented by delegates. The president then appointed a committee on nominations, the members of which were Mr. W. W. Bean, chairman; Mr. D. G. Hamilton, Mr. E. C. Foster, Mr. W. F. Kelly, Mr. J. R. Chapman, Mr. H. C. Payne and Mr. E. H. Davis.

The meeting then adjourned.

In the afternoon the delegates quite generally attended an excursion to Nantasket Beach. The usual beach diversions were enjoyed, after which the excursionists sat down to a Massachusetts clambake.

THURSDAY, SEPTEMBER 8.

The meeting was called to order by the president at 10:30 A. M. The first paper read was that by Mr. W. H. Holmes on "To What Extent Should Railway Companies Engage in the Amusement Business?" The paper pointed out the expending ideas of the duties of a city government to its inhabitants and the fact that the cities themselves now often provide entertainment in public parks and squares, in which case the street-railway companies find this particular occupation taken out of their hands, and the writer of the paper considered that this tendency should be encouraged, the street-railway companies confining themselves to the provision of ample means of communication with these public places of amusement. The maintenance of these enterprises by the street railway itself has generally been found to be ill-advised and unprofitable, except in locations such as warrant more than the five-cent fare. The losses attendant on unfavorable weather, the difficulty and expense of carrying away large numbers of people at one time and the time of the managing officers of the street railway necessarily given over to this auxiliary work were given as potent reasons why the companies themselves should not engage in the amusement business. The author's experience in this line in Kansas City was described, the sum spent by the railway company itself being regarded as a doubtful investment. The company has therefore abandoned this line of work and serves only parks maintained by independent corporations, the company paying these corporations a fixed sum for giving its patrons the free privileges of the parks. The company has given financial aid to various festivities which have occurred in Kansas City, and the author stated his confidence that these sums were wisely spent.

The question was quite generally discussed, the opinions being very closely divided for and against the establishment of places of

amusement by the companies. At the conclusion of this discussion the report of the Nominating Committee was made as follows:

For president, Charles S. Sergeant, second vice-president Boston Elevated Railway Company, Boston.

For first vice-president, Henry C. Moore, president Trenton Street Railway Company, Trenton, N. J.

For second vice-president, Ernest Woodruff, president Atlanta Consolidated Street Railway Company, Atlanta, Ga.

Third vice-president, Walton N. Holmes, general manager Kansas City Railway Company, Kansas City, Mo.

Secretary and treasurer, Thomas C. Penington, treasurer Chicago City Railway Company, Chicago, Ill.

Executive Committee:

Albion E. Lang, president Toledo Traction Company, Toledo, Ohio.

George E. Yuille, second vice-president of the West Chicago Street Railroad Company, Chicago, Ill.

Frank Jones, president Memphis Street Railway Company, Memphis, Tenn.

John I. Beggs, general manager Milwaukee Railway & Light Company, Milwaukee, Wis.

Ira McCormack, general superintendent Brooklyn Heights Railway Company, Brooklyn, N. Y.

A unanimous ballot was then cast for the gentlemen nominated and it was voted that the next place of meeting be Chicago, Ill.

The president then appointed a committee to report on the question of the carrying of mails by street railways, consisting of the following gentlemen: John T. Burnett, Boston; Henry C. Payne, Milwaukee; Ira A. McCormack, New York; D. G. Hamilton, Chicago; and W. S. Dimmock, Council Bluffs.

An invitation was read from the Boston Elevated Railway Company, inviting the delegates to visit any of the power houses, shops or car houses of the company, saying that special instructions had been issued to have particular attention shown visitors.

The privileges of the floor were then granted to Mr. T. Y. Dzushi, Chief of Finance and Manager of Stores of the Imperial Government Railways of Japan, and Mr. K. Sugahara, chief engineer of several street railroads soon to be built in Japan. The latter thanked the association for the hospitality extended. The street railways systems of Japan he stated to be in a primitive stage as yet. There are only about 60 miles of track in use, and most of this trackage is operated by horse power. Several electric railways, however, have been proposed. In Tokyo there are about 40,000 jinrikisha and 90,000 wagons drawn by men, which greatly interfere with the progress of street railways.

A resolution thanking the Massachusetts Street Railway Association and the local committees for the entertainments provided was made and carried, as was one expressing appreciation of the work of the officers of the association for the last year.

A paper by Mr. Fred D. Perkins was then read by the secretary on "The Inspection and Testing of Motors and Car Equipments by Street Railway Companies." An abstract of this paper may be found in another column. Owing to lack of time there was no discussion of this paper.

The meeting then adjourned.

During the afternoon the delegates attended a special excursion to Plymouth, where they visited Plymouth Rock, Plymouth Hall and the national monument to the Pilgrim Fathers. At the latter point the secretary of the Pilgrim Society gave a brief history of the landing of the Pilgrims and the building of the monument. The party stopped at the Samoset House for refreshments and returned to Boston by special train in time to prepare for the banquet. This was held at the Brunswick, and was attended by nearly 350 people, including many ladies.

The toasts and the gentlemen responding to them were as follows: "The Commonwealth" was responded to in the absence of Governor Wolcott by his private secretary, Mr. J. M. Perkins; "Rapid Transit in Boston," Hon. George G. Crocker, chairman of the Rapid Transit Commission; "The New England Bar," Hon. Samuel J. Elder; "Orators and Oratory," Hon. P. A. Collins; "The New England Press," Mr. Stephen O'Meara, Boston "Journal."

FRIDAY, SEPTEMBER 9.

The meeting was called to order at 10:40 A. M. The first paper read was that by Mr. R. W. Conant on the "Cost of Electric Power for Street Railways at the Switchboard." An abstract of this paper will appear later.

After a brief discussion the report of the Committee on Standard Rules for Government of Conductors and Motormen was requested, but the committee wished more time and an appropriation, which were granted.

The newly appointed president was then escorted to the chair and introduced by the retiring president, Mr. Sergeant responding and thanking the association for his appointment and promising to do everything in his power to further the interests of the association and to benefit the street railways.

The association then adjourned.

In the afternoon a trip was taken to Norumbega Park in Auburndale, which was reached over a trolley line extending through several of the most beautiful of Boston's suburbs.

Charles Spencer Sergeant.

C. S. Sergeant, the newly elected president of the American Street Railway Association, was born in Northampton, Mass., in 1852. His father, George Sergeant, was born in Stockbridge, Mass., which has been the family home since the settlement there in 1735 of his great-great-grandfather as a missionary to the Stockbridge Indians.

CHARLES SPENCER SERGEANT.

He was educated in the public schools of Northampton, where he graduated from the high school in 1868, in which year began his business career in the employment of the First National Bank of Easthampton. In 1872 he entered the steam railroad business as paymaster and cashier of the Marquette, Houghton & Ontonagon Railroad Company, in Michigan, and was later associated with various iron companies and engaged in the iron smelting business.

In 1876 he moved to Boston to take the position of chief clerk of the Eastern Railroad Company, and was subsequently appointed general auditor. In December, 1887, when the West End Street Railway Company came into possession of the several street railways operating in Boston, he was offered and accepted the position of general auditor of the company, subsequently being made second vice-president, and in November, 1892, being appointed general manager, which position he held until the lease to the Boston Elevated Railway Company, of which company he is now second vice-president.

Objections to Electrical Signs in London.

It appears that the London County Council has proposed regulations to prevent the use of what are called flash light lamps, this term signifying electric signs intermittently illuminated. It is said to be a nuisance to the traffic and a source of danger to pedestrians, owing to the variations in lighting of the principal highways or "circuses," as one of the English electrical journals terms them.

DIGEST OF CURRENT ELECTRICAL LITERATURE

AMERICAN AND FOREIGN

By Carl Hering

Dynamos, Motors and Transformers.

DYNAMOS. Guilbert. "L'Eclairage Elec.," August 6.—Illustrated descriptions of various recent improvements, taken from patent specifications.

Lights and Lighting.

SERIES ARC LAMP.—Lond. "Elec. Eng.," August 26.—Answers to a request to give the principal essentials of an arc lamp for series connection.

SERIES INCANDESCENT LIGHTING. Hood. "Elec. Eng.," September 1.—A short article describing the system used at the Pitman Grove camp meeting grounds, which plant is run during only three months of the year. The lines are run on the trees; the main part of the grove is laid out like a wheel, and is lighted by a three-wire 208-volt system supplied from a large transformer at the centre, but the larger part of the extensive grounds is lighted with the series incandescent system, which, in this case, differs from any other in having no street fixtures, shunt boxes or cut-outs. The primary voltage is 1080, the lamps being of 106 volts; each circuit has about 4000 feet of No. 10 wire. At the beginning of each circuit there is a signal lamp, which burns when the circuit is opened, and when this is the case the attendant starts over the circuit and is provided with a short-circuiting hook, which is provided with a lamp the leads to which form two hooks, and with this he bridges the insulating joint in the wire, across which a lamp is connected; the lamp on his hook will then light when the bad lamp is reached. These circuits have been running a total of 400 hours, and only three lamps have burned out, the total number of lamps being 160. The average cost of erection has been but $3.60 per lamp, against $20 for the standard series system, and it has given equally good service.

Power.

GAS POWER ON SHIPS. Booth. Lond. "Elec. Rev.," August 26.—An article in which he recommends the use of gas power on board ship, converting the power into electrical energy and thence back to mechanical energy through motors. He claims that in this way the largest ships could be readily manœuvred from the bridge. The objections to using gas power are overcome by this combination; when once started the engines would continue to revolve; gas power could thus be applied at sea with a less total weight of plant and with less fuel consumption than when high-class steam engines are used. The difficulty in connection with gas engines is the starting, stopping and reversing at short intervals; with the aid of electricity these mechanical defects are removed. He recommends the use of several smaller units, so that any injury to one would not cripple the vessel. There is no such economy in gas engines of increased size as there is in steam engines, and therefore the same objection does not apply to sub-dividing the units. All gas pipes are to be kept down to the keel level, where the danger of a shot reaching them is very small.

POWER PLANT FOR LIGHTING STATIONS. Appelbee. Lond. "Elec. Eng.," August 26.—A reprint of a short paper on the designing of the mechanical portions of steam-driven central stations.

ELECTRIC ELEVATORS. Hawtayne. Lond. "Elec.," August 26.—A long abstract of his recent paper, which was noticed in the "Digest" June 18.

ELECTRICAL TRANSMISSION OF ENERGY. Blondel. "Eng. Mag.," September.—A brief abstract of a report to the French Government in the "Ann. Ponts et Chaus." The report was made preparatory to the formulating of a law concerning the transmission of energy in France; it seems to be general in character, discussing the various sources of power, its generation and transmission, and the numerous application of electrical energy; much valuable information is said to be given concerning existing installations. In the course of the report he states that the Seine along its whole course represents 25,000 horse-power; the total water power available in France is estimated at 10,000,000 horse-power; the total power of the Rhine at the falls is 1,750,000 horse-power; the total water power in Switzerland, which is already utilized, is 200,000 horse-power. He does not think water power is destined to supersede coal, as electrical transmission may make some coal mines available. One hundred and twenty-five tons of silver are electrically deposited every year.

COMPARATIVE COSTS OF STEAM AND WATER POWER. Webber. "Eng. Mag.," September.—An article analyzing the cost of power and comparing the present cost with that twenty-five years ago: an analysis of the estimated cost of developing a small water power is also given.

WATER POWER.—"Eng. News," September 1.—A note stating that the plan to develop the power of the Shawinigan Falls, about one hundred miles from Montreal, has taken definite form; the head obtainable is 165 feet, and the supply of water is capable of developing 200,000 horse-power, about half of which is to be used.

TRANSMISSION OF POWER.—"Eng. Mag.," September; abstracted from the "Jour. of the Western Society of Engineers."—A topical discussion in which electric, pneumatic and mechanical methods were considered; the abstract appears to contain nothing of importance.

STARTING GAS ENGINES. Leroy. "Prog. Age," September 1.—A translation, with both illustrations, of the article noticed in the "Digest" June 11 (see also last week).

NEW POWER PLANT AT AKRON, O.—"St. R'y Jour.," September.—An illustrated description of a new combination electric light and railway plant recently erected at Akron. The boilers are all fitted with mechanical stokers and forced draft. There is at present one 400-kw unit, and another will be installed soon.

Traction.

THREE-PHASE TRACTION PLANT.—Lond. "Elec.," August 26.—A brief, illustrated description of a short line recently opened at Evian-les-bains on Lake of Geneva; it leads from a hotel to the springs. The line rises 67 feet in a length of about 330 yards, the mean grade being 6.8 per cent. and the maximum 10.2. There is a three-phase station 8 miles distant, the current from which is transmitted at 5200 volts and a frequency of 50; it is transformed down to 200 volts. The small single car weighs 3.8 tons and seats eight passengers; it has one three-phase motor for 15 horse-power, whose speed is 750; it drives a countershaft, which drives the axle by means of chain gearing; the field is stationary, and the armature revolves, being connected to starting resistances by means of brushes; on the descent the motor acts as a brake, running at slightly greater velocity than the speed of synchronism; if one of the trolleys gets off the wire the motor continues to run as a single-phase motor, but if both trolleys fail the hand brake must be used. The car makes sixty double journeys per day at a speed of 6¼ miles per hour.

TRACTION BY ELECTRIC POWER. Elliott. Lond. "Elec. Eng.," August 26.—A reprint of a short paper, which is chiefly of a historical nature, and appears to contain nothing of importance.

ELECTRIC RAILWAYS IN AUSTRIA.—"Zeit. fuer Elek.," August 14.—Statistics for the second quarter of the present year for the electric railways in Austria.

TRACTION IN BERLIN.—"Elek. Zeit.," August 25.—A full-page map containing the various electric lines which will exist in Berlin when the present project has been carried out; this will be accomplished in four or five years, and Berlin will then have the largest and densest network of street railways of any city in Europe.

LONDON CENTRAL UNDERGROUND RAILWAY. Tripier. "L'Eclairage Elec.," August 13.—The first part of a long, illustrated description of this new underground electric railway; it includes many illustrations.

ELBEUF.—"L'Eclairage Elec.," August 6.—An illustrated description of this system of lines, which was opened last May; the total length is 6 miles, and there are twelve motor cars and six trailers.

BRADFORD.—London. "Elec. Eng.," August 26; more briefly in Lond. "Elec. Rev."—An illustrated description of the system of trolley lines in that city.

MOTOR CARRIAGES.—Lond. "Elec.," August 26.—Brief descriptions of the electric vehicles at the Agricultural Hall exhibition.

THE ROTARY CONVERTER IN STREET RAILWAY WORK. Bell. "St. R'y Jour.," September.—He first discusses the design and illustrates the connections of the ordinary types of single, three and four-phase generators, motors and converters and of motor generators. The use of rotary converters for distributing power for large city railway lines is discussed; the advantages here lie in the generation of all the power in a large station, and hence more economically than in a number of small stations, and also in having the load more uniform; the cost of installation, however, will usually be greater than where small stations are used, and the cost of labor will be higher. The average electrical efficiency of the system for city distribution with converters will be from 75 to 50 per cent.; depreciation is also greater, so that, unless power can be generated 30 per cent. cheaper in one large station than in several small stations, the latter are cheaper. The writer then proceeds to discuss the possibility of this, and shows the approximate cost in cents per kw hour of producing power in stations of from 100 kw to 2500-kw capacity, working with load factors of 40, 50 and 70 per cent.; the curves are based on coal at $3 per ton. From this diagram he concludes that if the sub-stations have as large as 1000-kw capacity there will be no economy in a city sys-

tem in alternate current distribution with rotary converters, unless the main station will have a capacity of 10,000 kw or more.

POWER CONSUMPTION IN RAPID-TRANSIT SERVICE. Armstrong. "St. R'y Jour.," September.—A reply to a criticism by Carus-Wilson in the last issue of an article by Armstrong in the June issue, upon the relative economy of rapid and slow acceleration of electric cars. Armstrong states that Carus-Wilson's criticism, that the first article did not compare the electrical losses in the motors in the two methods, is not pertinent, as the article was intended to cover only mechanical losses, and was thus applicable to all motive powers; electrical terms were used in some cases only for the convenience of the reader. For electrical work, however, he does not accept Carus-Wilson's conclusions, as the latter, in computing the losses, considered the resistance losses only; the losses in the armature core and in the gearing should also be considered, and these are greater in the slow-acceleration method. Taking all things into consideration, the author reaffirms his original position and refers to his June paper before the American Institute of Electrical Engineers for further details.

POWER CONSUMPTION IN ELECTRICAL RAILROADING. Dodd. "St. R'y Jour.," September.—A reprint in full of the paper noticed in the "Digest."

METERS ON CARS. Connette. "St. R'y Jour.," September.—The Nashville street railway, which operates from forty-five to sixty cars, buys its power from the local electric light company at a certain price per kw hour, and recently equipped each of its cars with a wattmeter; the objects were to check up the amount of power consumed, and also to keep individual records of the current used on each car as a test of the skill of the motorman. The company has found the practice very successful, particularly in making the motormen careful of power, as their records are compared, due allowance being made for grades, etc. The power was thus reduced from between 1.75 and 1.90 kw hours per car mile to 1.10 and 1.15, or about 35 to 40 per cent. Car meters also aid in detecting defects in motors, for if the records show that one car takes more current than another under the same conditions the motormen are first changed; then if the excess continues a careful examination of the motors is made.

ELECTRIC RAILWAY MOTORS. Hanchett. "St. R'y Jour.," September.—The concluding article of his series; he discusses general practice. In regard to the motor casing, the preferred form is a four-pole machine, all the poles being excited; consequent pole motors usually produce sparking at the commutator, and have other drawbacks. The bearings on motors are being made long, and a length of 8 inches on a 30-hp motor is not uncommon. While an inclosed motor is used for tramway work, the best practice for elevated railway and heavy electric railways tends toward leaving the motor case open as much as possible to ventilate the motor by cooling. The universal method of opening street railway motors is now to swing the lower half downward and provide means by which the armature may be retained in either half at pleasure. Strenuous efforts have been made by modern designers to increase the efficiency of railway motors, but it remains at about 85 per cent., though in some cases as high as 92 per cent. has been claimed. The preferred practice in armature coils winding is to have separate coils capable of being slipped on the core. While this makes rather a long armature, it reduces the amount of useless wire on the armature and makes it easy to insert new coils. Practically all armature cores are now toothed, and modern practice seems to tend to reducing the armature diameter and the number of slots, and increasing the number of conductors per slot. Spur gearing is used exclusively, but the author states that worm gearing has never received a fair trial. The table accompanying the article gives the chief dimensions, weights, etc., of the principal American railway motors.

TRACTION MOTOR.—"St. R'y Jour.," September.—A description of the G. E. 55 motor. It is of 175 horse-power, and is designed for elevated and underground railroads, as well as high-speed interurban lines. As it is not intended for surface service, it is less protected from dust than the usual type, and is consequently better ventilated. The magnet frame is cast in one piece, and at each end is a bored-out opening large enough to allow the removal of the armature, field coils and magnet pole pieces, which are bolted to the inside of the frame. The weight of the motor is approximately 5000 pounds. (See The Electrical World, September 10, page 272.)

LARGE RAILWAY GENERATORS.—"St. R'y Jour.," September.—Side and end elevations and full descriptions with main dimensions of a generator built for Boston, of 2700 kw nominal capacity, but capable of working up to a much greater amount if overloaded. Its approximate weight, without engine shaft, is 300,000 pounds; the armature will weigh 15,000 pounds; the shaft is 37 inches in diameter; the field magnet has twenty-four poles and is 21 feet 8 inches in height; it is of steel and hollow; the armature is 15 feet 6 inches in diameter. (See page 301, this issue.)

DOUBLE TRUCK CARS IN NEW YORK.—"St. R'y Jour.," September.—A large three-page inset shows plan, end and side-half elevations and sections and details of the type of long double-truck car adopted as standard by Metropolitan Street Railway Company of New York, for use on its electric conduit lines. The car body is 28 feet long, or 36 feet over all.

RAIL BONDS.—"St. R'y Jour.," September.—An extended description, with illustrations, of the principal rail bonds on the market at present. Twenty forms are described and illustrated.

STREET RAILWAY CONDITIONS AND FINANCIAL RESULTS IN METROPOLITAN BOSTON.—"St. R'y Jour.," September.—Statistics of the cost of operation and construction, with an analysis of some of the operating expenses of the different street railway systems in metropolitan Boston; the figures in the tables are arranged according to the magnitude of the companies' operations. The article is illustrated with a large number of maps.

NEW YORK, NEW HAVEN & HARTFORD R. R. CO. Heft. "St. R'y Jour.," September.—He mentions the electric extensions made by this company during the past year at Hartford, New Britain and Nantasket; all of these extensions use the third-rail system. The company has also equipped with the trolley system a branch line 8 miles in length near Stamford; this line was formerly operated by steam power, and the trolley system is used principally because the company wanted to make it possible to run the cars over the tracks of the Stamford street railway system for a short distance in Stamford; the article is devoted chiefly to this new Stamford installation. The car bodies are 37 feet over all, and equipped with two 175-hp motors each; the cars make a speed of 50 miles per hour on level track; the chief feature of the novelty in the railway is the truck; by moving four bolts the upper half of the truck, with the car body, can be raised, allowing the four wheels, with the motors, to be run out from below. The spring suspension for the motors is entirely separate from the spring suspension for the car bodies; this enables the latter to be graduated to any extent desired, making a very easy riding car. The axles are hollow and of open hearth steel; they have a diameter of from 5.5 to 8 inches; the diameter of the bore extending through the axle is 1.5 inches. Two bonds are used at each joint; the bond terminals are of the "crown" type, but the steel pins by which they are attached to the rail are forced through by a special tool and not driven through by a hammer, as usual.

LONG-DISTANCE POWER TRANSMISSION PLANT AT MONTPELIER, VT., WITH BATTERY AUXILIARY.—"St. R'y Jour.," September.—Barre and Montpelier are 9 miles apart, and are connected by an electric railway, operating five cars; the running time between the two cities is forty-five minutes. Current is supplied from water power 8 miles from the nearest point on the line, and is transmitted to a sub-station near the middle point of the railway by the three-phase system at 6300 volts and a frequency of 120; two 150-kw step-up transformers are used at the water power station, and are connected with the sub-station transformers by three No. 6 rubber-covered wires. At the sub-station the current is reduced from 6300 volts three-phase to 480 volts two-phase by step-down transformers, and then to 550-volt direct-current by a 150-kw rotary converter for the line. The direct-current side of the rotary converter is compound wound to suit the working voltage of the battery under the widely fluctuating loads, so that the battery will keep up the fluctuations without the aid of a booster; as a result no feeders are required on the trolley line. This line has just been put in operation, and is said to be the first example in the United States of an electric railway operated exclusively from rotary converters with storage battery auxiliaries.

THE TRAMWAY SYSTEM OF BRISBANE, AUSTRALIA. Brown. "St. R'y Jour.," September.—This system is about 25.5 miles in length, and has recently been built. The power station contains three 450-hp compound-condensing engines, each directly connected to a 400-hp generator. The article is fully illustrated.

BOSTON ELEVATED RAILWAY COMPANY.—"St. R'y Rev.," August 15.—A long, illustrated article on the lines of this company, which controls all the street railway lines in Boston and ten other cities and towns in the suburbs.

NEW ELEVATED RAILWAY IN BOSTON.—"St. R'y Jour.," September.—A brief article outlining the engineering features of the proposed electric elevated railway in Boston.

BOSTON SUBWAY.—"St. R'y Rev.," August 15.—A brief, illustrated article on this subway.

THE BOSTON SUBWAY.—"St. R'y Jour.," September.—An extended article on this subway.

Installations, Systems and Appliances.

TIME SWITCH METHOD OF CHARGING. Gibbings. Lond. "Elec.," August 19.—In this continuation of his serial on the commercial and business aspects of municipal electrical supply (see "Digest" June 25), he describes and discusses the time switch method of charging and the Manchester system. In the latter city the five-wire system is used; there are two alternative methods of charging, one a uniform rate of 12 cents per unit and the other a fixed charge per annum per lamp installed in addition to a charge per unit as registered on the meter; tables are given comparing the two systems.

COMMON RETURN FOR TWO-PHASE SYSTEM.—Lond. "Elec. Eng.," August 26.—Brief discussions of the advantages and disadvantages of a common return in the two-phase system for supplying power and light.

RHEOSTATS.—"L'Eclairage Elec.," August 6.—Brief, illustrated descriptions of motor-starting and arc lamp rheostats and resistances, as made by a French company.

Wires, Wiring and Conduits.

WIRING ACCESSORIES. Hundhausen. "Elek. Zeit.," August 25.—A reprint of a long paper, containing many illustrations,

read at the recent annual meeting of the Union of German Electricians; it refers to the various accessories developed and used by the Siemens & Halske Company, some of which are not new. The greater portion of the paper refers to the illustrations, and cannot, therefore, be abstracted. In referring to fuse wires he mentioned the fact that his company had used silver wires in place of lead, but that for certain practical considerations this has again been abandoned in favor of a more suitable metal. For currents up to 30 amperes and voltages from 250 to 500 the lead fuses of his company can be used by putting two in series; with a short circuit both will then fuse simultaneously, each taking care of half of the energy; with an overload, however, generally only one will blow, as it is practically impossible to have them both exactly alike, and in these cases the fusing of one is sufficient; this was found to answer well at 500 volts. Materials used for inclosing the fuses differ considerably in their properties; many of those that are quite refractory, such as porcelain, glass, etc., are not suitable because they not only fuse but even become conductors in that condition; on the other hand, materials such as wood, paper, hard rubber, etc., which are not fireproof, are especially well adapted to resist the effects of a short-circuiting arc, but they are not suitable when there is a more prolonged generation of heat; the materials which answer both requirements best appear to be plaster of-paris and cement, the latter being given the preference. He then discusses the question of non-interchangeable fuses. illustrating the devices used. The other illustration refers chiefly to branch connections.

Electro-Physics and Magnetism.

CURRENT RUSHES IN TRANSFORMERS. Hay. Lond. "Elec. Rev.," August 26.—The initial stages of any forced periodic disturbance are known to differ, sometimes very materially, from the ultimate steady state; when an alternating voltage, for instance, is introduced into an inductive circuit there will in general be highly distorted initial waves, the amount of distortion depending on the phase of the voltage at the closing of the circuit; the insulation of a transformer, for instance, is in danger of being broken down by this initial current rush at the instant of switching on. In the present article he develops a theory of the impulsive current rushes in transformers, after a brief reference to other articles on the subject. No conclusions are drawn in the present portion.

NEW RADIO-ACTIVE SUBSTANCES. P. and S. Curie. "L'Eclairage Elec.," August 6.—A reprint of an Academy paper. They found that certain minerals containing uranium and thorium are very active in the emission of Becquerel rays, the activity being even greater than that of uranium or thorium, and it was thought that this was due to some other very active substance included in these minerals, as, for instance, in pitch-blende, the protoxide of uranium. They suggest that this may be a new element, and if its existence can be confirmed the discovery of it was due to its production of Becquerel rays.

CATHODE RAYS. Villard. "L'Eclairage Elec.," August 6.—A reprint of an Academy paper on the emission and propagation of these rays.

COLORED PHOTOGRAPHS BY ACTINO ELECTRICITY. Delvalez. "L'Eclairage Elec.," August 13.—A short Academy note describing the following process: If a plate of brass forming a parasitic electrode is immersed in a mixture of the acetate of copper and lead and a current be passed through the liquid colored images will be produced, due to the deposition of the peroxide of lead; if different points of a plate of brass are unequally illuminated, local currents will circulate in the liquid, the circuits of which are closed through the plate; these currents produce electrolysis—that is, will deposit peroxide of lead at certain parts and those points which are equally illuminated will have identical colors; the colors vary with the amount of illumination. Experiments verified this deduction. The deposits observed were not caused by differences of temperature.

RESISTANCE OF ALLOYS.—Lond. "Elec. Rev.," August 26.—An editorial reference to a recent article by Shaw in "Nature," August 11, in which he discusses the behavior of alloys with regard to their resistances at low temperatures, the subject being treated theoretically; he considers the subject in the light of the microstructure of alloys.

PROPERTIES OF THE VAPORS FROM THE CARBON ARC. Merritt and Stewart. "El'ty," September 7.—A brief abstract of an A. A. A. S. paper. They found that the vapors from an arc light behaved almost exactly like gases which have been acted on by X-rays, with respect to their power of discharging an electrified body, the only difference being that these gases retain their discharging power longer. When the vapors are drawn from the arc through a tube and caused to pass between a charged body and one which is grounded the former will gradually lose its charge, but the discharging current is not proportional to the voltage, as it increases less rapidly than the latter and approaches a limiting value. The discharging property is greatly increased if the vapor of water is introduced into the arc. The phenomena observed may be explained on the assumption that the air is ionized by passing through the arc—that is, the molecules of the air are to some extent torn apart so as to form positive and negative ions like in electrolysis. It is thought that the experiments probably have an important bearing on the theory of conduction in the electric arc.

CATHODE RAYS. Merritt. "El'ty," September 7.—A brief abstract of an A. A. A. S. paper on the magnetic deflection of diffusely reflected cathode rays. He measured the deflection of the so-called para-cathodic rays in a given magnetic field and compared it with the magnetic deflection of the direct cathode rays in the same tube, but could detect no difference in the behavior of these two sets of rays. He is therefore of the opinion that the para-cathodic rays are really the same as cathode rays, and result from diffuse reflection.

COHERERS. Arons. "El'ty," September 7.—A reprint of the abstract noticed in the "Digest" August 20.

Electro-Chemistry and Batteries.

ELECTROMETALLURGY. Ashcroft. Lond. "Elec.," August 19.—A long abstract of his recent paper on his method of treating the Broken Hill sulphide ores by the wet extraction process and the electrolytic deposition of zinc; this is the paper referred to in the "Digest" of September 10. His process was tried in Australia at an expense of one and a quarter million dollars, and has finally been abandoned; the paper, however. is of interest as an account of the novel and extensive metallurgical work. The original process consisted in treating the roasted mixed sulphides with a ferric chloride solution; in the electrolysis of the crude zinc chloride thus obtained with the removal of zinc as a metal, and the dissolution of iron and its oxidation to ferric chloride in anode compartments, thus returning the ferric chloride required in the extraction bath; the latter portion was finally abandoned, and the process became one of the simple extraction of zinc from the roasted ore with sulphuric acid, and the electrolysis of the resulting solution of zinc sulphate. Much good work was done in the determination of the conditions necessary for obtaining a good deposit of zinc. Editorially it is thought that at best there would be only a modest margin of profit owing to the decline of the value of silver and the fact that the value of electrolytic zinc is not much greater than that of ordinary zinc.

ELECTROMETALLURGY. Tommasi. Lond. "Elec.," August 26.—An article on a process of extraction, separation and refining of metals, chiefly of silver-lead, in which he endeavors to show that there is a margin of profit in electrolytic refining greater than that in the usual processes; the advantage is proportionately greater the smaller the amount of silver. He describes his process with the aid of illustrations, and makes tabulated estimates of the cost. Editorially it is thought that the figures need considerable revision. His method consists essentially in receiving the refining metal on a revolving disc cathode, from which the spongy deposit is scraped off: an acetate bath is used, which is said to contain certain secret ingredients. The lead is obtained in a finely divided state.

ELECTROLYTIC IRON. Haber. Lond. "Elec. Rev.," August 26.—An abstract of the article noticed in the "Digest" April 2 and June 25.

ELECTROLYTIC DEPOSITION OF GOLD. Wohlwill. Lond. "Elec. Rev.," August 26.—An abstract of the article noticed in the "Digest" April 16.

ELECTROLYSIS OF ALKALINE CHLORIDES. Kellner. "Zeit. fuer Elek.," August 14.—A brief abstract of his recent Chemical Congress paper. It seems to be general in character, discussing the various methods, but more particularly the use of the mercury cathode.

AFFINITY OF BASES AND ACIDS. Hollard. "L'Eclairage Elec.," August 13.—A short article on the affinity of bases and acids and the phenomena of electrolytic dissociation. He deduces the following laws: "The accumulation of electro-negative groups in the neighborhood of the hydrogen of an acid increases in general its dissociation constant, and the accumulation of electro-positive groups diminishes it. The accumulation of electro-positive groups in the neighborhood of the group O H of a base increases in general its dissociation constant, and the accumulation of electro-positive groups diminishes it."

IONIC REACTIONS. Kuester. Lond. "Elec. Rev.," August 26.—An abstract of the original article noticed in the "Digest" July 16.

SUGAR REFINING.—"Zeit. fuer Elek.," August 21.—A note on the Say-Gramme process, which is being tried at Piesdorf. The article is not technical in character; for treating daily 250 tons of beets 250 horse-power are said to be required, and the amount of sugar remaining in the liquor is reduced to one-fifth of that in the ordinary process.

OZONE.—Lond. "Elec. Rev.," August 26.—A short, illustrated article on the Andreoli ozonizers, other similar descriptions of which have already been noticed in the "Digest."

CONGRESS OF APPLIED CHEMISTRY.—"Zeit. fuer Elek.," August 14.—A report of the third international congress, which was held in Vienna in July; short abstracts of the papers are given; these are noticed under their respective headings.

JACQUES CARBON BATTERY. Langley. "Jour. Frank. Inst.," September.—An article giving the results of the investigations of Rosewater and Oldham; the article is practically the same as the one which was abstracted in the "Digest" June 4. The tabulated figures have been reduced to curves; the curves of volts and

temperatures approach and recede each other—that is, when the temperature goes up the volts drop; the e. m. f. produced by carbon against iron is not materially greater than iron against iron; this is distinctly opposed to Jacques' theory. To again test this theory he put some sodium nitrate into the melted alkali, but obtained a diminished instead of an increased e. m. f. The experiments showed that the cause of the current is thermo-electric.

LEAD-ZINC-CADMIUM STORAGE BATTERY.—"El'ty," September 7.—A reprint of the article noticed in the "Digest" last week.

CYANIDE PROCESS. Richards. "Cassier's Mag.," September.—A short article describing and discussing this process and its application, from a technical standpoint. There are about forty cyanide plants in the Transvaal, twenty-five in the United States and several in Australia and New Zealand; the value of the gold annually extracted by these plants is nearly $15,000,000. A few illustrations are given of various plants. In conclusion he points out the directions in which this process is being improved.

ELECTRO-SYNTHESIS. Mixter. "Am. Jour. of Sc.," September.—A second paper on this subject, describing researches.

Units. Measurements and Instruments.

ALTERNATING CURVE RECORDER. Callendar. Lond. "Elec.," August 26.—A description of a new apparatus, which is intended to reduce the labor of the determination of such curves, as it draws these quite automatically in the form of a continuous pen and ink curve; it can be set to record the curve every half hour throughout the day, and may be left entirely to itself; it is capable of very accurate work. It consists essentially of a recording potentiometer, working in conjunction with a cycle contact maker; by means of a simple worm gearing the contact brushes are revolved slowly, and the point of the cycle which is to be determined is continuously varied with the motion of the record sheet, so as to form a continuous curve. The recording pen, which is of the usual kind, is attached to the sliding contact of a delicate relay on the potentiometer bridge wire; this relay is made to actuate a pair of motors in such a way as to keep the sliding contact always at the balancing point. The drum is of the usual kind, and may be made to revolve once an hour. (No illustrations are given other than some samples of curves). The recording potentiometer is briefly described; it was found that a very delicate relay was required and had to be constructed especially for this purpose. He hopes to exhibit the apparatus at the next British Association meeting at Bristol. The cycle contact maker and the synchronous motor are both briefly described; he found that the resistance of the cycle contact was a matter of considerable importance. The curves shown were drawn with a rough, experimental apparatus, and do not show the capabilities of the method; one pair shows the volt and current curves on the primary of a transformer; these were verified indirectly by comparison with curves determined in other ways, and were found to be at least as accurate as those obtained by a much more laborious method. Another curve shows the discharge of a small storage battery through a constant resistance; another shows the kilowatt output of a large 1500-kw street railway generator, in which quite rapid fluctuations were recorded. It could be made much more sensitive by increasing the sensitiveness of the relay.

THE GALVANOMETER IN THE BRIDGE SYSTEM. Murphy. Lond. "Elec.," August 26.—He describes some experiments made to get an idea of the current necessary when comparing resistances by the bridge method, in order to secure a certain power of appreciation under different conditions of resistance and galvanometer efficiency; the results are said to be rather remarkable and noteworthy. Two Thomson and one Sullivan marine galvanometers were used, and the results are plotted in curves, which are reproduced and which show a departure from what would have been expected; he found that whatever the resistance and the galvanometer characteristic, the higher the ratio arm resistance, the less the battery current required; also that the suspended coil galvanometer (like the Sullivan) occupies a position in the order of merit which is not justified by either its resistance or its figure of merit, in which two respects it is lower than either of the other instruments, while it practically holds the first place in the order of efficiency in question. These apparent anomalies led to an investigation in which they were cleared up most satisfactorily; the principal outcome is an addition and important reason for the use of the d'Arsonval type of galvanometer for bridge work. The measurement of the testing power in terms of current instead of voltage, which latter was the condition under which Kempe investigated the bridge problem, leads to the first departure from previous conclusions. He shows how the Kempe formula is to be changed. The degree of inclination of the curves which he obtained is a measure of the rate at which the testing current must be increased to preserve a constant degree of appreciation, as the resistance tested increases. The results obtained by experiments were confirmed by the theory. The curves are practically straight lines, and can readily be plotted for a given galvanometer. His conclusions are that the ideal bridge galvanometer will be such that while its resistance is negligible, its figure of merit is infinitely high; these are antagonistic requirements in the fixed coil type, but not in the suspended coil type. Could a galvanometer be constructed with a figure of merit of 500 megs. and a resistance of 1 ohm, the battery current required to test a resistance up to 10,000 ohms would not differ much from 4.1 milli-ampere with any ratio, and the sensibility of the bridge with higher currents would be proportionately great. The heating of the bridge coils with currents, at present necessary, seriously interferes with the accuracy of tests.

COMPARISON OF LOW RESISTANCES. Fisher. Lond. "Elec.," August 26.—A communication in reply to that of Callendar, noticed in the "Digest" August 27. Callendar claimed that thermo-electric effects existed when resistances are compared by means of the potentiometer; Fisher claims that with the Crompton standards of resistances these thermo-electric effects do not arise. The rest is not of general interest.

NEW POST OFFICE BRIDGE.—Lond. "Elec." and "Elec. Rev.," August 26.—A brief, illustrated description of an improved form of this instrument, which has been a Government standard for about twenty years; the improvements are chiefly in detail.

STANDARD CELL. Jaeger. "L'Eclairage Elec.," August 13.—Abstracts of two papers, one from the "Wied. Ann.," 63, page 354, on the modification of the sulphate of zinc in the Clark cell, and the other from Vol. 65, April, on the e. m. f. of the cadmium amalgam cell, both of which articles have already been referred to.

DETERMINING THE FREQUENCY OF ALTERNATING CURRENTS. Kinsley. "El'ty," September 7.—A brief abstract of an A. A. A. S. paper, in which he mentions the various methods depending on the vibration of a wire acted upon by a magnet in circuit, the tension on the wire being varied; also of making the air in a tube vibrate in unison with a telephone connected with the circuit, the effective length of the tube being varied.

Telegraphy, Telephony and Signals.

SUBMARINE TELEGRAPHY. Fahie. Lond. "Elec. Eng.," August 26.—The beginning of an article on the archæology of submarine telegraphy, which is supplementary to the recent book by Bright, which gave very few references to the pre-practical history of submarine telegraphy. He begins with the date 1795.

SIGNALLING IN THE GERMAN NAVY. Pontifex. Lond. "Elec. Eng.," August 26.—A brief, illustrated description of the system of signalling with incandescent lights, devised by Kaselovski. It is operated by various combinations of the lamps, and has been adopted by the German Navy. The principal features are that only one switch key is used; that the movement of the key breaks both poles of the circuit; that it is mechanically rigid, and that it is not affected by dampness. A key moves around a centre like a crank, and may be depressed into any of a number of different notches; the various combinations are determined by the position of the key, and the circuit is made and broken by depressing and raising it. It appears that six lamps are used.

TELEPHONE SYSTEM. Bechtold. "Zeit. fuer Elek.," August 14.—An illustrated description of his method of connecting a succession of telephones to a single line for railroad services, so that each operator can talk only with the two neighboring stations; the result is accomplished by means of induction coils.

TELEPHONY IN ROME. Battandier. "Cosmos," August 6. A brief, illustrated description of the telephone station in that city.

WURTEMBURG.—"Elek. Zeit.," August 25.—Extracts from the telephone statistics for that country up to the end of last year.

TELEPHONE STATISTICS OF EUROPE.—"Eng. News," September 1.—A short table from a consular report, giving the number of lines, instruments, and the number of inhabitants per telephone. In the latter Sweden heads the list with 115; then comes Switzerland with 129; in Germany it is 397, and in France 1216.

INDEPENDENT TELEPHONY FOR LARGE CITIES. Fisk. "West Elec.," September 3.—A short article proposing an ideal exchange for a city like Chicago, to be operated in connection with the independent telephone companies. The chief drawback of these companies is their inability to furnish long-distance service to the large cities.

RELAY RESISTANCE.—"Teleg. Age," September 1.—A discussion of Hewett's article (see "Digest" September 3), followed by a reply by the original author.

Miscellaneous.

FOG DISSIPATOR.—"El'ty," September 7.—An editorial reference to a recent article by McAdie, in which he expresses the belief that fogs at sea may be dissipated by the method suggested some years ago by Lodge, who recommends the use of very powerful influence machines, one pole of which is connected to the mast, thus coagulating the fog, which then falls as rain. He thinks the time has now come when this suggestion should be tried. It is hardly to be expected that the fog will be dissipated at any considerable distance from the vessel.

MEETING OF AMER. ASSN. FOR ADVANCEMENT OF SCIENCE.—"Science," September 2.—The beginning of a report of the proceedings, including the presidential address. None of the papers reprinted are on electrical subjects.

LEAGUE OF MUNICIPALITIES.—"Prog. Age," September 1.—The continuation of the report, including reprints of the papers, of the proceedings of the second annual convention of the League of American Municipalities.

BOSTON.—"St. R'y Rev.," August 15.—A long article, with numerous good illustrations, giving an historical sketch of this city. This is followed by another long and profusely illustrated article by Whiting on the story of Boston.

Three Large Exhibits at the Street Railway Convention.

THE EXHIBIT OF THE WALKER COMPANY.

A piece of apparatus which street railway men from large cities looked at with considerable interest as foreshadowing what they may be obliged to come to some time was a section of the Love open-conduit electric road, shown in the Walker Company's exhibit. This full-sized section is the same that was shown at the Electrical Exhibition in New York, and described in THE ELECTRICAL WORLD of May 14, 1898, the only different feature being the omission of the car body. Two 15-L motors, similar to those now being supplied to the Brooklyn elevated road, were shown, as well as two of the new 33-S street railway type. One of the latter was shown in operation, and the other open to show the construction. The main features of construction are the use of laminated poles bolted to a cast-steel shell, polar extensions holding the field coils in place. The features of the armature were shown by four in different stages of construction, showing how the band wires are sunk below the level of the ends of

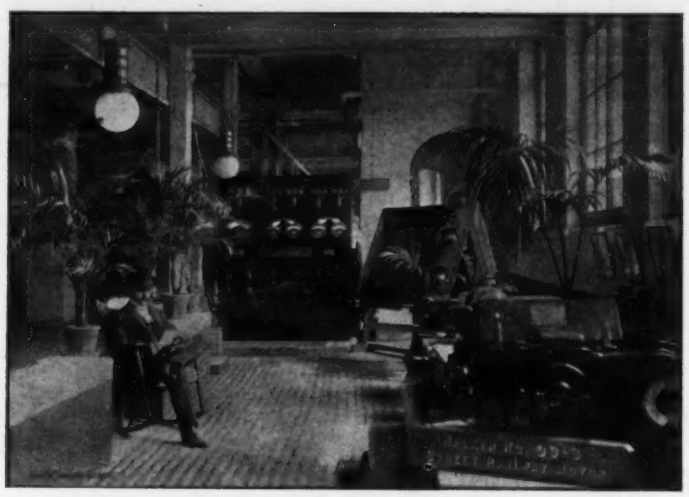
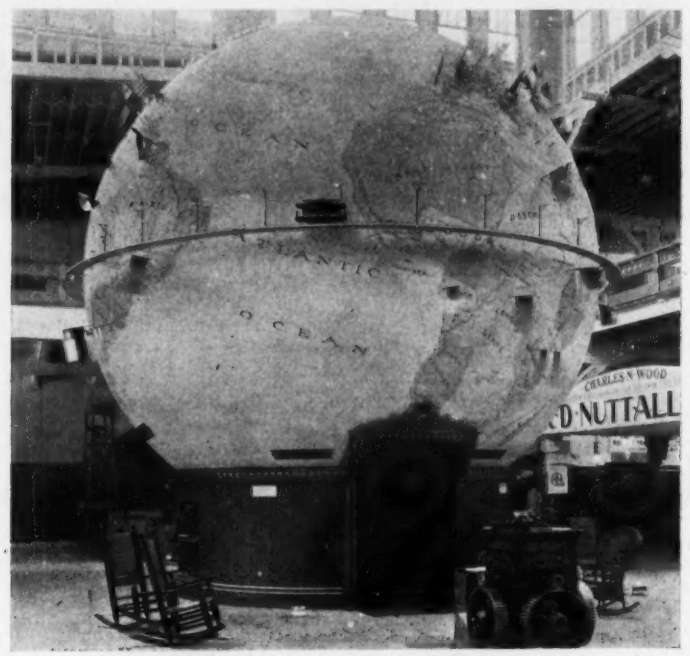


EXHIBIT OF THE WALKER COMPANY.

the teeth, by making the teeth beneath them shorter than the others. This absolutely prevents any possibility of stripping action if the armatures rub against the fields, since the only part of the armature that can strike is the core teeth. The commutator of this motor was shown assembled and the wires soldered in before it was turned up. A panel mounted on an easel in the exhibit showed all parts of the 33-S motor complete from the keys and set screws to the connectors. In another part of the exhibit was the standard 3-A trolley and base, which is notable for the ingenuity displayed in the avoidance of patents owned by competitors. Two of the eleven styles now made of the Type S controller were on exhibition as well as a model connected up with a short circuiting switch around the solenoids to show the reduction in the arcing when the solenoids are in action. The controller itself shows one recent change, namely, the elimination of special positions of the reversing switch for cutting out either one or the other of the motors, this being effected in the new model by hooking back the contact fingers so that they will not bear on the reversing switch segments. A new style of this controller, fitted for an emergency brake, is now being developed by the Walker Company, but unfortunately was not far enough along to be shown at the convention. A switchboard of polished slate, showing one generator and two feeder panels of the Standard Walker construction, stood at one end of the space, and was connected up with the motors in operation and also with seven of the Walker inclosed arcs. A large amount of printed matter, circulars and photographs completed the exhibit, which was looked after by Mr. H. McL. Harding, J. S. Anthony, M. D. Law, J. D. Moore and others.

THE ELECTRIC RAILWAY AROUND THE WORLD.

The General Electric Company made rather a new departure in its exhibit at this convention,showing very little apparatus of interest, but making a spectacular display in the line of a globe laid out to represent the world, with a miniature electric railway running around the equator. The globe itself was 26 feet in diameter, covered with papier-maché, accurately mapped out and studded with miniature incandescent lamps at all points where General Electric plants are located. The various countries and colonies were distinguished by the national flags, and the stars and stripes appeared prominently over the Philippines, the Ladrones, Hawaii and Porto Rico. The miniature lamps were naturally most dense in the United States of America, but wherever land appeared above the ocean there was almost certain to be a lamp. A miniature car electrically lighted ran rapidly on a narrow platform built horizontally around the equator. The interior of the globe was handsomely furnished and used as a reception room. In the line of apparatus the General Electric Company showed very little. Naturally with the convention at the headquarters of Mr. Caryl D. Haskins, the street railway integrating wattmeter was well to the front, and was shown wired up to a controller, and motor fitted with a brake to show the operation of the meter. The only new apparatus the company showed, but a line which will probably come into wide use, were the new indicating measuring instruments for switchboard service. These are intended to give as accurate results as the highest grade switchboard instruments now on the market, and combine in their design several new features. The deflection is obtained by a Deprez-d'Arsonval movement, but the magnetic field, instead of being that of a permanent magnet, is that of an electromagnet, excited by current taken across the bus bars. To prevent the fluctuations of the voltage in this exciting circuit affecting the accuracy of the instrument, the restoring force is also magnetic and dependent on the same excitation, so that any variation of the voltage in the exciting circuit affects both alike and leaves the indication unchanged. This electromagnetic feature prevents the instruments being affected by any permanent demagnetizing effect of heavy bus bars in the immediate neighborhood, an action which frequently occurs with instruments of the permanent magnet type. The instruments are also rendered independent of any immediate disturbance from the neighboring bus bars by a construction which renders them static. Dead-beat movements are obtained by means of a foucault current brake in the same magnetic field that gives the deflection. With no permanent magnets to demagnefize or restoring springs to weaken, these instruments should be about as unchanging as it is possible to make them. Mr. F. M. Kimball and C. D. Haskins were in charge of the installation of the exhibit at the hall. The General Electric Company's strongest feature at the convention was what it termed its operative exhibits, consisting of the many railway and other electrical plants in Boston and the immediate vicinity, to which it was intended to personally conduct parties by the many representa-

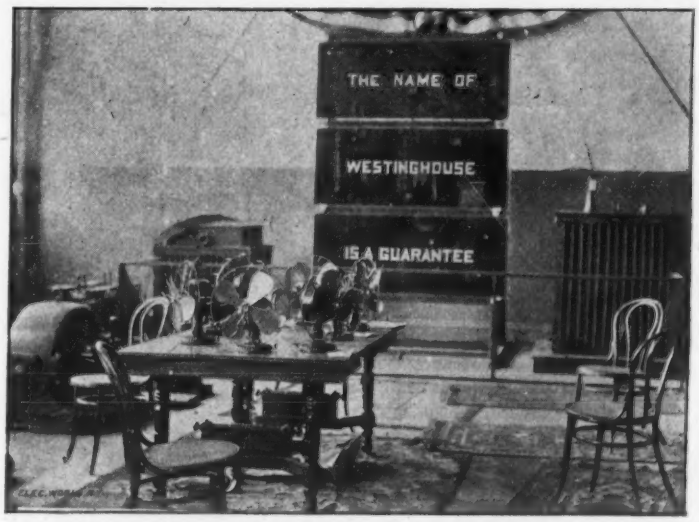


THE GENERAL ELECTRIC COMPANY'S EXHIBIT.

tives of the company attending the convention. This plan could not be carried out in full, however, owing to the counter attractions provided by the association and its entertainers. The company distributed a neat brochure entitled "The General Electric Company at Boston," giving handsome views of various power stations, the subway and the Lynn works of the company, as well as an illustrated guide to the city. The company also entertained its friends at the headquarters at the Brunswick Hotel.

NOVELTIES SHOWN BY THE WESTINGHOUSE ELECTRIC COMPANY.

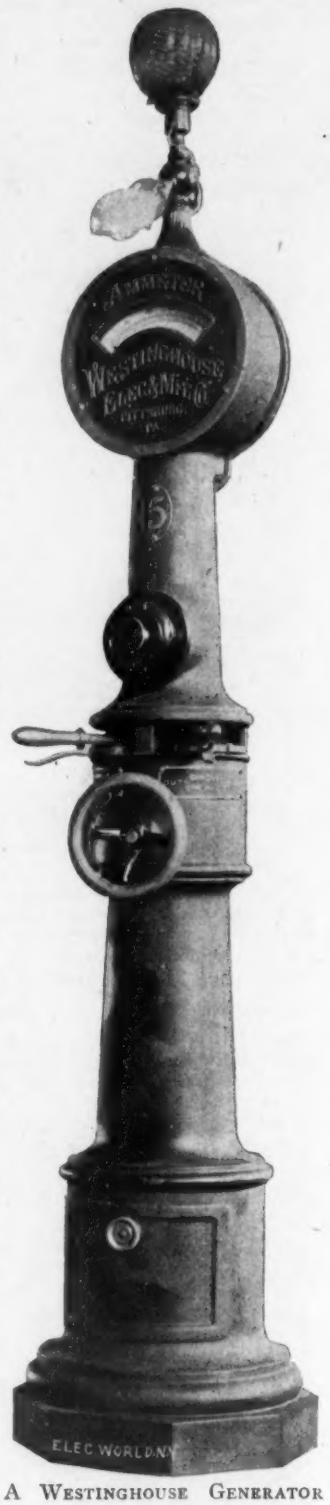
No one with ears to hear could escape having his attention called to the exhibit of the Westinghouse Company, whenever the lightning was played on



A PART OF THE WESTINGHOUSE EXHIBIT.

the slogan of the Westinghouse Company, "The Name of Westinghouse is a Guarantee," which was mounted in metal letters on large plate-glass panels, and

connected up with a 50-kw, 60,000-volt transformer, the disruptive discharges from which had a most impressive audible and visible effect. The most interesting part of the Westinghouse exhibit and perhaps the most interesting feature of all the exhibits to street railway men was the new switchboard arrangement, but more properly the switchboard substitute, one equipment of which was shown in operation. A system of this kind is now being installed for the Consolidated Traction Company, of Pittsburg, and part of this system was borrowed for the exhibition. In this new arrangement the current switching and circuit breaking apparatus, instead of being mounted on panels of the switchboard, may be mounted at any convenient location, whether directly accessible to the machine attendants or not, and is controlled by compressed air from valves mounted in pedestals conveniently placed near the machines themselves. These handsome cast-iron pedestals, one of which is shown in an accompanying illustration, each control one generator or feeder. The generator pedestal has at the top a Weston round-type ammeter, below this a voltmeter switch, below this two handles operating compressed air valves, one controlling the main generator switch and the other the circuit breaker, and below these handles a rheostat wheel connected by gearing to a field rheostat below the floor. The compressed air valves are interlocking, so that the main switch cannot be opened when the circuit breaker is closed, nor can the circuit breaker be closed except while the main switch is open. The most novel part of the whole system is the circuit breaker itself, which, instead of being fitted with knife contacts, closes the circuit through a lot of copper-leaf springs, the ends of which bear against the opposite terminal. The arc of the opening circuit is taken across carbon terminals and the breaker can be closed either by the compressed air from the pedestal at a distance or by means of a handle located upon it. The triple-pole double-throw main switch has also the same style of contacts, making the switch much more easily opened or closed than those with knives entering tightly binding jaws. The throw-over arrangement will be used in the Consolidated traction work for the two sides of a three-wire system. The equipment shown in the exhibit was rated at 2000 amperes capacity, and has been tested with that current at 2500 volts. The compressed air was supplied for the system by means of a 2½-hp motor, direct coupled to a rotary air compressor of the eccentric cylinder and wing-blade type, the starting and stopping of the motor being controlled by an automatic switch. The Westinghouse Company also showed at this convention some alternating current apparatus consisting of a 500-volt, 25-kw rotary converter. This was driven by direct current, and fed from its alternating current end an alternating current induction motor, which in turn was coupled to a 500-volt machine used as an exciter for the rotary. In the line of transformers, besides the high voltage one mentioned above, there was one large auto-transformer of 15-kw capacity arranged to give any voltage from 80 volts to 4000 in steps of five volts, this being accomplished by means of sections variously divided and tapped off, the divisions being arranged somewhat as are the divisions on a Wheatstone bridge to get any desired combination. In the line of street railway motors the newest thing in the Westinghouse exhibit was the 49-motor rated at 35 horse-power. The winding of this motor is rather ingenious, being a combination of the straight-out and spiral end connections, giving the coil an almost rectangular form; that is, the end connection is almost straight from slot to slot. The other motors shown were the 38-B, of 50 horse-power, and the 12-A, of 25 horse-power. Car rheostats wound up with iron ribbon surrounded with cast-iron rings, with mica insulation and capable of running red hot; lighting arresters, choke coils, tank lightning arresters, toggle joint fuse blocks, a combined hood switch and automatic circuit breaker and Wurts non-arcing railway lightning arresters were also shown, the latter being exhibited under fire from a static machine. An illustrated pamphlet entitled "Electric Street Railway History," pictured clearly the apparatus constructed by the company in this motor line. The exhibit was installed by Mr. L. E. Imlay, who was the engineer in charge. The merits of the apparatus were explained by the following district managers: Mr. C. Townley, Boston; Mr. M. Coster, Chicago; Mr. T. C. Frenyear, Buffalo; Mr. J. R. Gordon, Atlanta; Mr. C. A. Bragg, Philadelphia; also by Mr. F. H. Raylor, general sales manager, of Pittsburg; Mr. N. W. Storer, engineer of the direct current work, and Mr. R. S. Brown.



A Westinghouse Generator Controlling Pedestal.

Supplies and Supply Men at the Convention.

MR. H. E. RUNDLETT represented the E. P. Allis Company, Milwaukee, Wis.

THE NATIONAL ARC LAMP COMPANY, Boston, was represented by Mr. F. B. Smith.

MR. G. M. ANGIER represented the Eddy Electric Manufacturing Company, Windsor, Conn.

THE CHICAGO INSULATED WIRE COMPANY was ably represented by Mr. W. M. Smith.

MR. ROMAINE MACE was the personal representative of the Okonite Company, Ltd., of New York.

THE JANDUS ELECTRIC COMPANY, Cleveland, Ohio, was well represented by Mr. George W. Rowbotham.

MR. W. E. SESSIONS, manager of the Sessions Foundry Company, Bristol, Conn., did not miss the convention.

THE PITTSBURG TROLLEY POLE COMPANY'S interests were judiciously looked after by Mr. H. B. Weaver.

MR. LUTHER STEIRINGER was present, and, as usual, was enthusiastic over any artistic display effects in the exhibits.

MR. GEORGE A. McKINLOCK, president of the Central Electric Company, Chicago, was an attendant at the convention.

THE CREFELD ELECTRICAL WORKS, Saylesville, R. I., were represented by Messrs. L. A. Lockwood and A. S. Montgomery.

THE SIMPLEX ELECTRICAL COMPANY, Boston, had an able representative at the convention in the person of Mr. J. H. Mason.

THE JOHN A. ROEBLING'S SONS COMPANY was represented by Messrs. A. M. Whitaker, G. W. Swan and Robert W. Welch.

THE AMERICAN VITRIFIED CONDUIT COMPANY, of New York, through Mr. C. H. Hill, set forth the advantages of its conduits.

THE PHILLIPS INSULATED WIRE COMPANY, Pawtucket, R. I., was represented by Mr. Henry C. Adams, Jr., secretary of the company.

MR. WALTER S. BARKER, of the Boston office of the New York Insulated Wire Company, took good care of the interests of his company.

MESSRS. ADAM COOK'S SONS, 313 West Street, New York, distributed a pamphlet on Albany grease and its advantages in street railway work.

MR. FRANK RIDLON, of the Frank Ridlon Company, Boston, one of the fathers of the electrical industries, spent much of his time with the visitors.

MR. H. B. KIRKLAND, the New York representative, and Mr. A. T. Clark, took good care to advance the interests of the American Circular Loom Company.

THE STREET RAILWAY LAMPS manufactured by the Bryan-Marsh Company had their merits described to the delegates by Mr. J. M. Hill, of the Chicago office.

MR. W. O. TURNER, New York agent for C. S. Knowles, of Boston, attended the convention and modestly, but nevertheless in a "get-there" manner, made his presence evident.

THE SAMSON CORDAGE WORKS, Boston, was represented by Mr. F. J. Coakley, and displayed samples of its trolley, bell and register cords; also the well-known Samson braid.

THE COLUMBIA MACHINE WORKS, of Brooklyn, made a display of commutators, brush holders, journal boxes, gongs, trolley cars, trolley frogs, trolley wheels and car brasses generally.

THE JOHN STEPHENSON COMPANY, LTD., New York, showed a model of the car bodies it is supplying for the splendid line of the Metropolitan Street Railway Company, of New York City.

THE HOLTZER-CABOT ELECTRIC COMPANY, Boston, delegated Mr. T. W. Ness to look after its affairs at the convention, and that gentleman proved to be an ardent exponent of his house.

THE STANDARD AIR BRAKE COMPANY, of New York, had on the ground two able representatives—Mr. Joseph R. Elliott, of the New York office, and Mr. John I. McAitchen, of the Boston office.

THE AMERICAN WHEELOCK ENGINE COMPANY, Worcester, Mass., had one of its strong features, the Hill valve gear, on exhibit in charge of Mr. James L. Kimball, of Boston, the New England agent.

MR. C. E. FARRINGTON, of the Massachusetts Chemical Company, Boston, was around discussing to all the well-known insulation of this company, already so popular with street railways and electrical engineers.

THE JANDUS ELECTRIC COMPANY, Cleveland, Ohio, exhibited its inclosed arc lamps for 500-volt, 110-volt and alternating circuits, Mr. H. F. Edgar, the New England agent, bringing out their good points.

MR. SEARS B. CONDIT, manager of L. A. Chase & Co., Boston, was here, there and everywhere, and at this convention was in especial demand because of the handsome pocket-knife souvenir he widely distributed.

MESSRS. GEORGE W. PROVOST and F. A. Estep together saw that the delegates did not return home without knowing more about the R. D. Nuttall Company and its products than they knew before the convention met.

MR. GEORGE F. PORTER was an indefatigable worker in the interest of "Kerite" wires and cables. His friends in the electrical world are legion, and as secretary of the National Electric Light Association he is widely known.

THE ADAMS & WESTLAKE COMPANY, New York and Chicago, made its usual display of curtains, trimmings, signal lamps, headlights and other details for the protection and comfort of passengers in street railway cars.

MR. A. L. DANIELS, a convention veteran, told the street railway men an interesting story about the H. B. Camp Company's earthenware conduits. The facts as presented by Mr. Daniels furnished his hearers with food for very careful thought.

GEORGE A. PARMENTER, Cambridgeport, Mass., showed a full-sized exhibit of his fenders and track cleaners, which are ingeniously arranged for clearing obstructions rigid enough to carry them away while holding firmly against lighter objects.

THE KEYSTONE ELECTRICAL INSTRUMENT COMPANY, Philadelphia, showed a railroad switchboard consisting of one generator and eight feeder panels equipped with Keystone instruments. On another board were

EXHIBIT OF THE KEYSTONE ELECTRICAL INSTRUMENT COMPANY.

various other styles of instruments, consisting of potential indicator, arc ground detector, constant potential ground detector, portable direct-current and alternating-current voltmeters, pocket polarity indicator, etc., the equipment being in charge of Mr. J. F. Stevens.

MR. A. L. REGISTER, of Pepper & Register, consulting engineers, Philadelphia, attended the convention to keep railway men advised of the fact that his firm does railway engineering work and to see that nothing new in the supply line escaped his attention.

THE DEARBORN DRUG & CHEMICAL WORKS, Chicago, were represented by their vice-president and general manager, Mr. Robert F. Carr, who is after street railway people as well as everybody else that uses boilers, and aims to do business wherever he sees a smokestack.

MESSRS. WHITMAN & COUCH, the well-known telephone manufacturers of Boston, increased their well-earned reputation through their new telephone apparatus for street railways, exhibited at the booth of Pettingell-Andrews Company, and which apparatus favorably impressed many street railway officials.

MESSRS. L. A. CHASE & CO., Fort Hill Square, Boston, distributed considerable literature concerning the Elden direct and altrnating current circuit breakers. Mr. S. B. Condit, the well-known representative of this firm, was active and energetic in keeping its specialties prominently before the delegates.

MR. JAMES S. SPEER, secretary of the Partridge Carbon Company, Sandusky, Ohio, in his quiet way sounded the praises of Partridge self-lubricating motor brushes. These brushes are so well known that they do not require brass bands or any other artificial means to bring them to the attention of street railway men.

TRUCKS, besides those exhibited by the Peckham and Brill companies, described in other notes, were shown by the McGuire Manufacturing Company, Chicago; the Bemis Car Box Company, Springfield, Mass.; Barney & Smith Car Company, Dayton, Ohio; the Taylor Electric Truck Company, Troy, N. Y., and the Baltimore Car Wheel Company, Baltimore, Md.

MESSRS. NAUGLE, HOLCOMB & CO., 355 Dearborn Street, Chicago, were represented by the manager of the construction department, Mr. George Weston, who made himself popular by the distribution of a convenient morocco-lined notebook, giving programme, officers, committees, etc., of the association, as well as information of interest about Boston.

MR. PERCY HODGES, late of the railway department of the Boston office of the General Electric Company, now New England agent of the John Stephenson Company, Limited, car builder, was kept busy receiving the best wishes of his many friends.

MESSRS. ROSSITER, MACGOVERN & CO., New York, distributed the usual price list of their second-hand standard electrical apparatus. Mr. Frank MacGovern was in attendance. Mr. Rossiter, of this firm, is the son of the well-known Brooklyn street railway manager, and the firm does a large business both with street railways and electrical lighting companies.

THE AMERICAN ELECTRICAL WORKS, Providence, R. I., were represented at the convention by Mr. W. J. Watson, its New England representative, and during the convention General Manager Eugene F. Phillips, President Frank N. Phillips, Secretary C. R. Remington, Jr., Treasurer Waggenseil, New York Agent P. C. Ackerman, and Chicago Agent Frank E. Donohoe dropped in.

MR. H. B. CUTTER, president of the Cutter Electrical & Manufacturing Company, Philadelphia, was present at the convention, and pointed with pardonable pride to his jewels in the exhibit of the Bibber-White Company. He mentioned that the company had lately made some 4000-ampere, double-pole circuit breakers for use in the new works of the Western Electric Company, New York City.

THE STANDARD UNDERGROUND CABLE COMPANY, Pittsburg, showed a line of samples of feeders, overhead, underground and submarine, especially adapted for 500-volt circuits, and paved the way for much new business through the efforts of Mr. G. L. Wiley, the New York manager; Mr. L. E. Hughes, Philadelphia manager, and Mr. F. A. Reinhart, treasurer of the company.

THE INCANDESCENT ELECTRIC LIGHT MANIPULATOR & CLEANER COMPANY, of Hyde Park, Mass., made an exhibit in charge of Mr. J. J. Dunn, manager, the apparatus shown consisting of rubber-lined nippers, designed to fit incandescent lamp globes, and mounted on the end of long poles, with attachments for screwing and unscrewing the bulbs or for cleaning them in place.

THE CREAGHEAD ENGINEERING COMPANY, Cincinnati, made an exhibit of overhead material in general, the most interesting novelty of which was called the Bourbon strain insulator, a peculiarity of which is its resemblance to a barrel, which probably gives it its name. The barrel is corrugated to increase the surface distance between terminals. The display was nicely arranged and in charge of Mr. G. R. Scrugham, superintendent of the company.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, was actively represented by Mr. Charles Blizard, of New York; Mr. F. J. Stone, Boston manager; Mr. F. H. Clark, Chicago manager; J. R. Williams, general agent, and J. L. Woodbridge, of the Boston office. The company had good working exhibits to show those interested in the three stations of the Boston Edison Company.

CAHALL BOILERS were not shown at the convention, but the characteristic detail parts of their construction were shown. One of these was the patent swinging man-hole plate hinged so that it can be opened like a door when unbolted, and another was the flowed steel header for the horizontal type of water tubular boiler. Mr. Winthrop Thayer, of Thayer & Co., Incorporated, Boston, the New England agents for the Aultman & Taylor Company, showed also photographs of many of the large installations of these boilers.

THE BILLINGS & SPENCER COMPANY'S exhibit was in charge of Mr. H. E. Billings, who made it a centre of attraction for old and new friends. Some 200 different designs of drop-forged commutator segments were shown, also drop forgings for Lundell motor cases and samples of its well-known over-

EXHIBIT OF THE BILLINGS & SPENCER COMPANY.

head material. The new catalogue of the company, illustrative of the 200 different designs of generators and stationary motor segments, was eagerly sought after, and a neat souvenir key ring was widely distributed.

THE OHIO BRASS COMPANY, Mansfield, Ohio, had a most bewildering display of overhead equipments, showing all its now well-known standard work, as well as some brand new features. Among the latter were a locking device for cap and cone hangers, consisting of a spring washer bearing against a metal ring moulded into the insulation, also a locking device for insulators of the West End style, consisting of a serrated rim of the protecting bell, the teeth of which can be turned under by a blow and keep the insulators from unscrewing. A new kink in Brooklyn strain insulators is the use of a bronze collar moulded under the head of the central part to prevent the shoulder of the encircling part from cutting into the insulation material. Many devices for use on figure 8 trolley wire were shown, a combination splicer for round wire at one end and figure 8 wire at the other, straight line clamping ear hangers for accommodating two wires within a few inches of each other and electrically connected being the most interesting. Special apparatus for coal mining to protect the insulation against the deteriorating action of the surroundings in these locations, feeder wire splicers, a new trolley splicer in which it is only necessary to poke the wires in and they will catch themselves so tightly that they break off without pulling out, curve pull-overs for suspending and insulating double trolley wire, flexible bracket suspensions, lightning arresters, bell metal bearings, etc., were a few of the items noticed. The exhibit was in charge of Mr. C. K. King, secretary of the company, and Mr. A. L. Wilkinson, special representative.

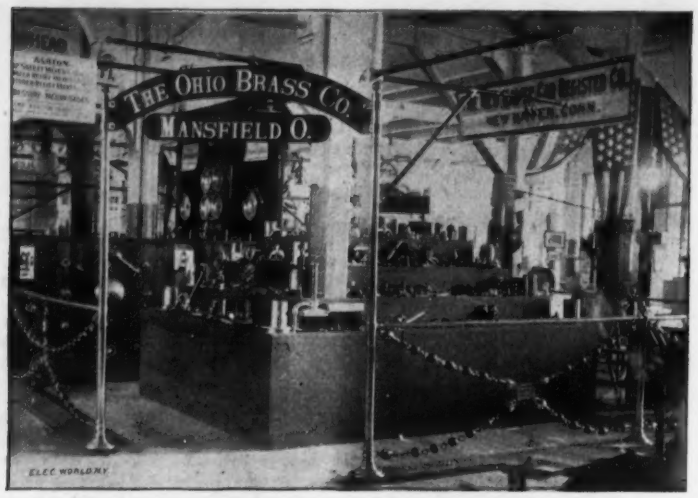


Exhibit of the Ohio Brass Company.

MR. J. E. EMERY, of Emery & Crump, street railway engineers, 146 Franklin Street, Boston, was on hand to advance the interests of the firm and to get the latest points from the supply men. This firm has recently constructed a road in Webster, Mass., and an extension of another road from Millbury to Northbridge, Mass., and is now doing the field work for the Bergen County Traction Company in New Jersey.

THE GARTON LIGHTNING ARRESTERS were objects of especial attention, and could not be very well missed, distributed as they were in the exhibits of the Pettingell-Andrews Company, Ohio Brass Company, Elmer P. Morris and the Walker Company, the latter company showing five arresters on the back of its standard railway switchboard. In addition to these exhibits Mr. J. V. E. Titus, secretary of the Garton-Daniels Electric Company, was present.

THE WATSON & STILLMAN COMPANY, 204 East Forty-third Street, New York, exhibited a line of long-felt wants in the shape of various hydraulic railway tools. The most convenient of these for street railway construction was an hydraulic girder rail bender capable of taking rails of any weight and size used in practice and bending them promptly and accurately to the required curves. Another device was a quick-acting hydraulic motor lift for pit work, for putting in or taking out motors beneath the car. Hydraulic jacks, punches, wheel presses, etc., were also shown and described by George L. Gillon, treasurer of the company.

THE JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J., generally gets out something slick either in the line of materials or exhibits. This year the company's representatives, Messrs. A. L. Haasis, E. A. St. John and J. H. Baird, sang the praises of Dixon's graphited wood grease for preventing noisy gears. This material consists of a wood pulp mixed with graphite, which cushions the blows of the gears, and is of such a consistency that it does not ooze out of the gear cases. Samples of Dixon flake graphite for rawhide pinions, graphited curve and track lubricants, belt dressing, commutator lubricant and other materials were given to interested delegates for trial.

MR. F. W. DARLINGTON, consulting engineer, 11 Broadway, New York, distributed at the convention an illustrated work on electric illuminated fountains, describing the magnificent fountain constructed under his superintendence in Brooklyn, N. Y. He also distributed a handsomely illustrated pamphlet, showing and describing railway stations and roads for which he has acted as consulting engineer, among them the Mount Vernon power house of the Union Traction Company, Philadelphia; the Burlington & Mt. Holly branch of the Pennsylvania Railroad; the mining equipment of the Crozer Coal & Coke Company, and the Golden Sceptre Gold Mining Company.

THE EDISON-BROWN PLASTIC RAIL BOND was exhibited and described by Mr. Harold P. Brown. As usual there was a showcase full of historical exhibits, showing rail sections which had been exposed to unusually severe service, with cork and plastic still operative, and a few new bonds, one consisting of a cross-bond terminal and one a plug bond, for connecting the angle plate with the foot of the rail. The disastrous effect of poorly bonded work was well illustrated by pipes eaten through by electrolysis. Mr. Brown distributed to the railway men a first mortgage bond of the Up-To-Date Street Railway Company, signed by Mr. P. Lastic Bond, president, and Mr. Resistance Low, secretary, per Manent.

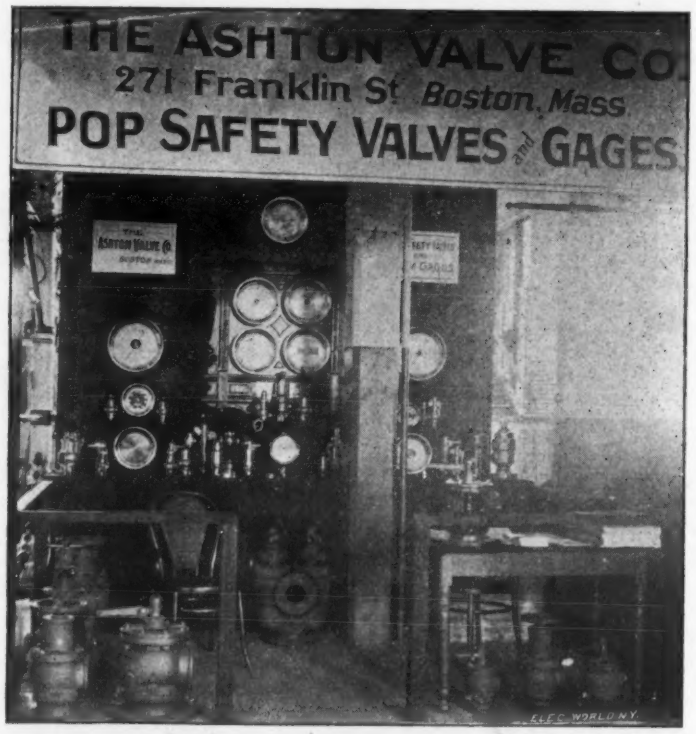
THE METHUEN ELECTRIC COMPANY, Methuen, Mass., exhibited a handy device the advantages of which were so obvious that everyone wondered why it had not been on the market and in use long ago. This is an insulated connector manufactured under the Osgood patent, and consisting of the ordinary brass sleeve connector with square headed set screws and a heavy rubber sleeve slipping over the same, slotted to allow the entrance of the screw heads, also to prevent them from unscrewing, and two rubber caps stretched tightly over either end and fitted closely around the wire insulation, rendering the whole water tight. The handiness of this device as compared with tape is obvious at a glance, and was made more so at the convention by the arguments of Mr. C. D. Holman.

THE NEW YORK SWITCH & CROSSING COMPANY, Hoboken, N. J., had on exhibition a full-sized magnetically operated switch for 9-inch girder rail, the arrangement being such that the switch can be controlled by the motorman of an approaching car by simply turning on his current while passing over a short special section of the track near the switch. The current turned on at this point is forced to pass to the track, return through a magnet which throws the switch over, while if the car drifts over this section the switch remains stationary. In this way the switch can be controlled from the car platform without any special mechanical devices and without stopping the car. Mr. W. C. Wood, president of the company, and Mr. L. E. Robert, sales agent, manipulated the equipment shown, and explained its working.

THE STANDARD THERMOMETER & ELECTRIC COMPANY, of Peabody, Mass., manufacturer of the Midget inclosed arc lamps for all circuits, was not represented with regular display in the main hall at the exhibition, but it had twelve of its lamps in the gallery, where they were used for lighting in the evening. The lamps were all running on 110-volt, direct-current circuit, were fitted with fancy covers of different designs, a few of the lamps having large opal shades, instead of the regular outer globe. A noticeably good effect was obtained by the use of a full ground outer globe on some of the lamps, producing a white, steady and evenly diffused light. Mr. M. L. Livingston, assistant manager of the company, and Mr. J. H. Hallberg, its electrician and designer, were in constant attendance, and looked after its interests.

THE WOODBRIDGE WIRING COMPUTATOR is about to be put upon the market by Mr. J. L. Woodbridge, 60 State Street, Boston, Mass., who attended the convention and interested many street railway men in this handy device. The computator is a set of cardboard circles and scales suitable for carrying in the pocket, which without computation gives from the necessary data the size and weight of wire needed for overhead trolley lines. Having given the load, which is assumed to be uniformly distributed at any given number of points along the line, the maximum allowable drop at the end of the line and the distance to the end of the line, the computator gives at once the cross section in circular mils of the various sections of the line, the cross section being greatest near the source of supply and reduced in steps in accordance with the law of minimum weight to minimum terminal drop. The computator also gives at once the total weight of copper used in the whole line.

THE ASHTON VALVE COMPANY, Boston, Mass., showed the usual line of pop-safety valves, water relief valves for pumps, cylinder relief valves for engines, gauges, etc. A section of the safety valve showed the means of obtaining regulation. Hydraulic relief valves working up to 1600 pounds' pressure were shown, and some special work, such as torpedo boat pop-valves built to work at 265 pounds' pressure, attracted attention. The exhibit was in charge of Mr. H. H. Ashton, Mr. A. C. Ashton and Mr. Charles Houghton.



Ashton Valve and Gage Exhibit.

THE MICA INSULATOR COMPANY, 218 Water Street, New York, was represented by Mr. C. W. Jefferson, the manager of the works in Schenectady. Among the products of this company were shown various samples of insulating board in plates 18x36 in size, some suitably hard for commutator segments, others designed to be softened by heating for moulding purposes, and a large line of mica paper and cloth; that is to say, thin sheets of mica with Japanese paper or some quality of cloth on either side. Various modifications were shown, an extra flexible cloth being obtained by the use of mica, gutta percha and paper. The company also makes a line of oiled silk, linen and asbestos papers, generally designated by the term "Empire," which were also shown at the convention.

THE ALBERT & J. M. ANDERSON MANUFACTURING COMPANY, Boston, filled a large booth with its special railway apparatus, some of which excited no little curiosity owing to its unusual character, since it was built

EXHIBIT OF THE ALBERT & J. M. ANDERSON MANUFACTURING COMPANY.

by specifications for foreign roads, the company having built up recently quite a considerable export business. One novelty shown was a practically straight underrunning insulated crossing constructed entirely of sheet steel, which, while considerable longer than heavy cast-brass crossings, was lighter and stiffer than the latter. Third rail supporting insulators are manufactured for elevated railway work also attracted interest, as did special hangers for English side trolley work. The Monarc inclosed arc lamp was the especial pride of Mr. C. B. Pear, who was in charge of the exhibit. It was stated that the company would soon put out a lamp suited for alternating current work. Ajax lightning arresters, figure 8 mechanical clips, section insulators, malleable iron line material, section switches with quick-break cast blades and many other details filled up this exhibit. One neat piece of apparatus worthy of special mention was the Ericsson voltmeter switch, in which the switch handle rotates and makes double pole-knife blade contact when pressed in at the proper rotary positions.

MR. ELMER P. MORRIS had a number of signs extending across the west end of the hall, where he gathered under his wing the exhibits of the many different companies for whom he acts as general agent. Among these companies are the Sterling Arc Lamp Company, of New York; the Keystone Electrical Instrument Company, of Philadelphia, both of whose exhibits are described elsewhere in these notes, and the following: Kosmic Oil Filter Company, Easton, Pa.; the Simonds Manufacturing Company, Pittsburg, Pa., showing gears, pinions and bearings; the Electric Railway Equipment Company, Cincinnati, showing poles, brackets and iron fittings; Harrington Rail Bonding Company, New York; and various instruments and materials, such as the Garton lighting arresters, Partridge self-lubricating motor brush, Monarch insulating paint, etc.

THE CROSBY STEAM GAGE & VALVE COMPANY'S exhibit contained as its most conspicuous feature a 12-inch single bell chime whistle with three chambers. The exhibit space was filled with indicators, steam, hydraulic and recording gauges, throttling calorimeters, lubricators, planimeters, revolution counters, thermometers, etc. The novel features were a new spring seat valve with tight V-shaped wedge seat; a new indicating and recording steam gauge, the recording dial being within the indicating circle, making a single round type instrument which can be mounted artistically on a gauge board; and a gauge tester without springs, but measuring pressures by scales and dead weights. Mr. Robert Pirie, New England sales manager of the company, was in charge of the exhibit.

THE GOLD STREET CAR HEATING COMPANY, New York, showed in its exhibit some new heaters for cross seats. The construction of these is somewhat modified from older types by the use of a zigzag enameled rod on which the helical wire coil is mounted instead of a twisted rod. This is said to give better ventilation and less cramping of the wire resistance. Three of these zigzag rods instead of one spiral are placed in one heater. The panel equipments are made up with a three-point switch, giving on any heat a uniform distribution between the panels. The company also showed an office heater with a small motor driven blower, the whole using about 30 kilowatts at full output. The representatives of the company stated that they were finding quite an extensive line of business in steamship work.

THE BOARDMAN-TUCKER COMPANY, 97 Oliver Street, Boston, showed a telephone system especially adapted for street railway work, the various stations being mounted in boxes and so arranged that the closing of the door of the box cuts the telephone inside out of circuit, thus eliminating the danger of burn-outs when the 'phone is not in use and preventing the interference effects of a large number of instruments on one line. With two or three instruments permanently connected at the general manager's office, the power station and car barns, for example, any number can be installed on the line without introducing too much impedance if connected in series, or too much leakage if bridged in, as only the instruments in use are in circuit. With instruments located at the switches of long single-track roads, a simple train dispatching system can be established, which is of great assistance in case of interference with the regular schedule. The advantages of such an equipment also in times of storm or other emergencies were described by Mr. A. F. Boardman, who had charge of the exhibit.

THE WAGNER ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., made an exhibit especially of measuring instruments and switchboard work for railway service, and also showed some of the new type F and type G transformers and a new switch which has just been brought out, consisting of an ordinary knife blade arrangement with carbon rollers pivotally mounted on the clips and pressing against the blade, following the latter on opening and taking the spark at a point where burning will not injure the contact between copper and copper. A new quick-break baby switch was also shown, the feature of which is the use of a spring to accelerate the movement of the blades and handle as soon as the pressure of the hand has overcome the friction in the closed position. The booth of this company was decorated with instructive photographs of heavy railroad switchboard work installed by the Wagner Company, and also of the works. Mr. E. H. Abadie, manager of sales, and Mr. H. M. Ney, New England sales agent, were in charge of the company's interests.

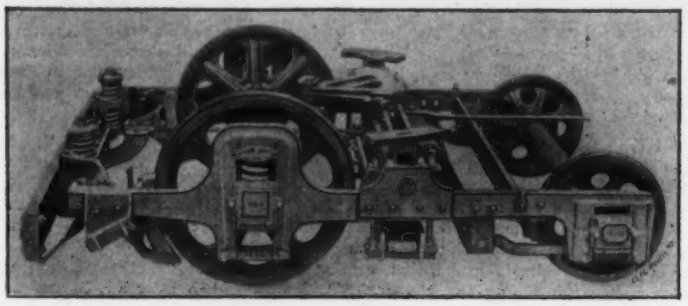
THE CONSOLIDATED CAR HEATING COMPANY, Albany, N. Y., showed its latest types of heater, consisting of galvanized iron wire helices placed in helical grooves on porcelain sleeves mounted with asbestos bushings and washers to prevent breakage, on square iron rods. The method of obtaining a uniform heat throughout the entire length of each heater on each step of the three-point switch is rather ingenious, each panel containing two coils throughout its length of different resistances. The first step of the switch puts the current on to the higher resistance, the second step cuts this out and puts it on to the lower resistance coil and the third step puts the two in multiple. The controllers are arranged with interlocking knife switch and control cylinder and are made so that they can be locked with a padlock in any position, keeping them under control of an inspector when desirable. The panels exhibited at the convention were equipped with lamps to show the various combinations. Two heaters which had seen five years' service were shown, mounted with a voltmeter and ammeter, which showed that they took as closely as could be measured the same current as that at which they were originally rated. The company was represented by Messrs. J. F. McElroy, R. P. Scales, of Chicago, general agent; R. N. Ransom, New York general agent, and W. P. Cosper, St. Louis general agent.

THE STERLING ARC LAMP COMPANY, New York City, showed a large line of inclosed arc lamps, the most interesting of which to street railway men were five in series on a 500-volt circuit. Four alternating-current lamps were shown, as well as two inclosed arcs for series circuits and ten constant potential lamps with various styles of trimmings. In a booth at one end of the exhibit X-rays were kept on ice for the benefit of those in need. Major R. J. Randolph, general sales manager of the company and one of the best known electrical men at the convention, was in charge of the Sterling Company's exhibit.

A LINE OF STERLING ARC LAMPS.

MR. W. R. KERSCHNER, representing the Columbia Machine Works (Buehler & Platt), 18 Fulton Street, Brooklyn, N. Y., did some excellent missionary work in behalf of his company. The Columbia Company manufactures a full line of railway supplies, and makes specialties of new and refilled commutators, dropped forged copper bars, trolley wheels, car trimmings, fuse boxes, bearings, adjustable break and controller handles, and other devices.

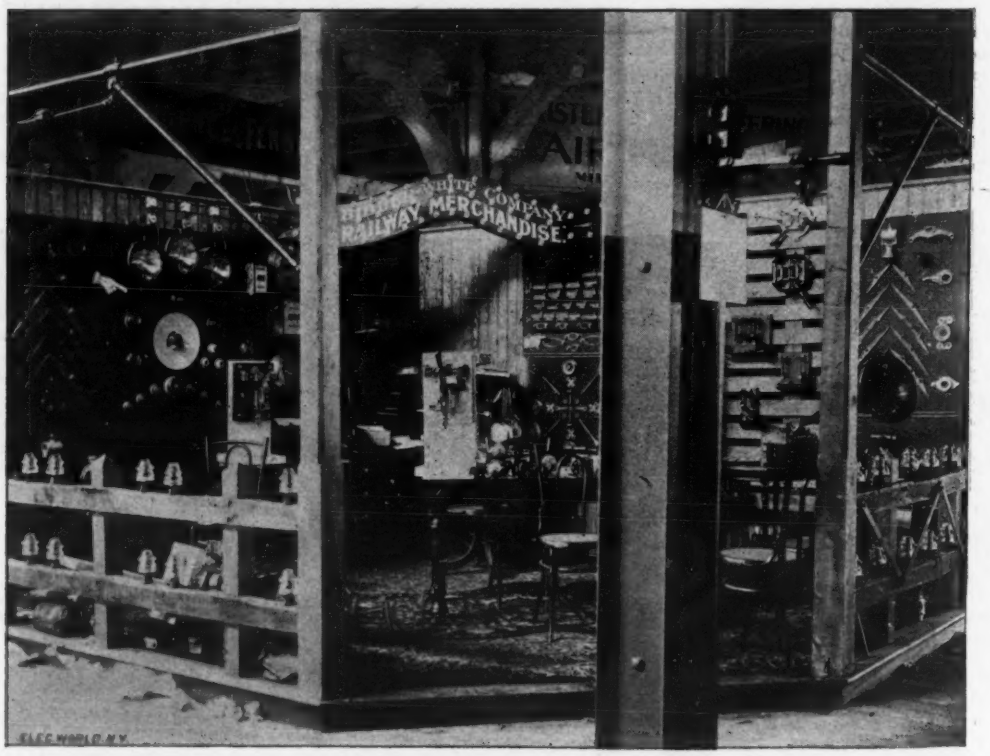
THE PECKHAM MOTOR TRUCK & WHEEL COMPANY made an extensive exhibit in the basement of full-sized samples of its comprehensive line of trucks, the most interesting feature of which was a new truck made in two weights, respectively known as No. 14 D-2 and No. 14 D-3, the design of which combines so many meritorious points that a description may be of interest. The truck is a centre bearing maximum traction swing bolster type, the maximum traction effect being obtained in two ways, one by offsetting the pivot



THE PECKHAM MAXIMUM TRACTION TRUCK.

from the centre of the truck toward the larger wheels, the other by overhanging the motor outside of the truck on the large wheel end. As shown in the accompanying illustration, the bolster is supported from the spring plank by a semi-elliptic and two helical springs, the spring plank hanging from the transom by links giving it a side play of about 3 inches. This swing bolster effect naturally reduces the tendency of the small wheels to jump the track at curves, whereby the weight upon them can be considerably reduced, giving added weight to the traction wheels and consequently greater freedom from slipping. The wheel base of this truck is about 4 feet 6 inches, the larger wheels being 33 inches in diameter and the smaller ones 20 inches. The truck, as may be seen in the illustration, is a remarkably low one. The exhibit at the convention and the parlors occupied by the company at the Hotel Brunswick were looked after by Mr. E. Peckham, Mr. J. A. Hanna, Mr. W. H. Gray and Mr. E. G. Long. The company distributed a handsome convention bulletin describing its trucks and their superior features.

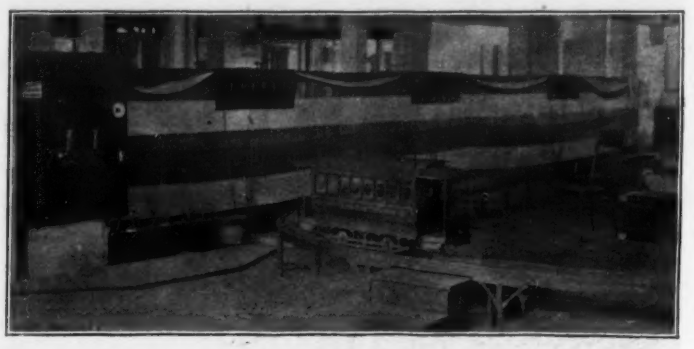
THE BIBBER-WHITE COMPANY, Boston, showed some big things in I-T-E circuit breakers, the largest being one rated at 3000 amperes. The particular pride of this exhibit, however, was agate ware overhead line material,



THE BIBBER-WHITE COMPANY'S EXHIBIT.

the agate covering preventing the malleable iron castings from rusting and avoiding the necessity of frequent painting, besides serving as an added insulation over and above the regular insulating material, the agate covering being of such a high resistance that a magneto will not ring through it. The Bibber-White Company exhibited the appliances of several companies for which it acts as agent, among them the protected rail bonds of the Forest City Electric Company, and the switches, etc., of the Hope Electric Appliance Company. The exhibit was looked after by Mr. C. E. Bibber, president of the company; Mr. H. W. Smith, manager of the railway supply department; Mr. E. L. Brown, treasurer, and Mr. D. W. Dunn, manager of the dynamo and motor department. A neat souvenir was a penholder made in a miniature imitation of a new corrugated steel trolley pole, patented by Mr. H. W. Smith. In the basement a convertible open and closed car, built for the Bibber-White Company, was on view.

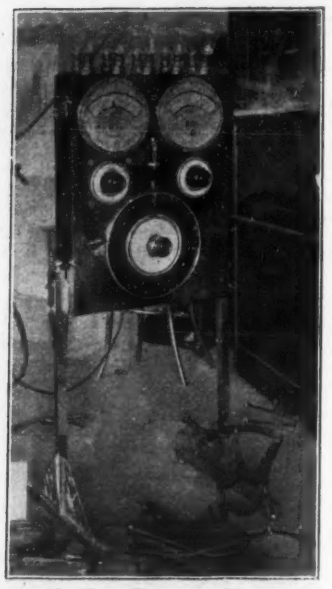
THE SAFETY THIRD-RAIL ELECTRIC COMPANY, Temple Court Building, New York, showed in the basement of the building an operating model on a small scale of its sectional conductor system. A miniature car running on a closed track with switches, crossings, grades, etc., was supplied with



THE SAFETY THIRD-RAIL SYSTEM.

current through the automatic cut-out and cut-in switches which are a feature of this system. The inventor, Capt. Murphy, was on hand to explain the operation, and was assisted by Mr. E. V. Baillard, who constructed the apparatus shown. Full-sized switches, with several improvements, were shown in operation on 500-volt circuits, carrying current the equivalent of that of a loaded car.

MR. A. B. HERRICK, 120 Liberty Street, New York, was present in person to explain the merits of his car testing equipment, which was on exhibition. This equipment comprises a Weston round-type ammeter and voltmeter, mounted with a dial circuit-controlling apparatus suitably arranged for making all the tests that may be desired in any street railway service. For ordinary inspectors' tests of car equipment the ammeter serves as a galvanometer in a Wheatstone bridge, giving by means of a zero method direct readings of the resistance of the car equipment in the various positions of the car controller. The voltmeter is arranged to read the insulation of car equipments in megohms direct, and also by means of plugs and the dial switch the resistances and insulation of fields, rheostats, armatures etc., may be measured. The instruments



HERRICK'S CAR TESTING EQUIPMENT.

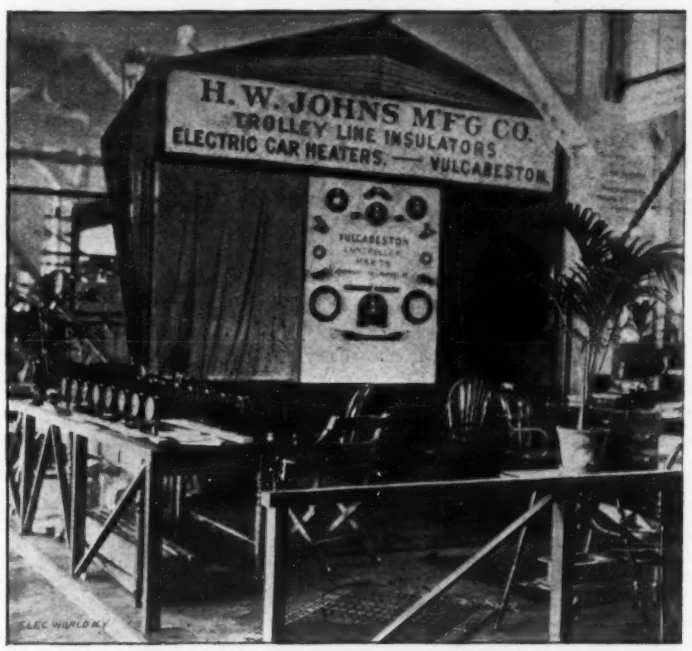
are arranged with several scales, and the dial switch with constants so that by the multiplication of the latter all measurements are direct reading, and the switch is so arranged that no mistake in connection can be made. The equipment may also be mounted on a car when testing it out for the first time, to try the equalization of current between the motors and to measure speed and acceleration.

THE PETTINGELL ANDREWS COMPANY'S exhibit presented neatly and conspicuously the company's varicus specialties. The entire exhibit was surrounded by a chain of ball strains linked together. Prominent was a handsome marble exhibition switchboard, in the centre of which was a 1000-ampere three-way switch, surrounded by other switches of larger and smaller capacity, and two new single pole quick-make-and-break types, manufactured by the Electric Railway Switch & Supply Company, at Springfield, Mass. In the centre of the exhibit was a large reel of 500,000 c. m. "O. K." feeder wire. In one

THE PETTINGELL ANDREWS COMPANY EXHIBIT.

corner were three large coils of Okonite submarine cable, lead cable and aerial cable. Another corner exposed two handsome sample boards, showing the well-known Garton lightning arresters and the Standard railway signal lamps in operation. The large assortment of overhead material, trolley wheels, construction tools, etc., attracted particular attention, as did also the handsome model of the Kilbourn Sand Feeder, because of its superior features. The exhibit was in charge of President Charles B. Price, Secretary F. S. Price and a staff of salesmen, who distributed to friends and customers a handsome leather cigar receptacle.

THE H. W. JOHNS MANUFACTURING COMPANY, of New York, was on hand with its standard system of panel heaters, containing resistance wires woven into an asbestos mat, and also with a new heater for cross-seat cars, containing coils wound on enameled iron rods inclosed in a perforated sheet steel casing. The panel heaters of this company are made with an extremely



H. W. JOHNS MFG. CO. CAR HEATERS, INSULATORS, ETC.

large surface and heat distribution so that a great volume of moderately heated air is given off instead of a comparatively small volume of highly heated air. The latter is more effective sometimes in making sales to an ignorant customer, but the H. W. Johns Company believes in the better principle regardless of expediency in making sales. The principle is carried so far that the panels are extended the whole length of the car. A full line of vulcabeston and moulded mica insulating parts was also on exhibition, and the company was well represented by Messrs. A. Hall Berry, manager of electrical department, and J. E. and S. G. Meek, of New York; J. W. Perry and D. F. Dickson, of Philadelphia; Mr. E. B. Hatch and H. H. Ruskin, Hartford, and H. C. Spaulding, Boston.

THE JOHNSON COMPANY, Lorain, Ohio, made an interesting and comprehensive exhibit, as this one company makes rails, special track work, trucks, motors and controllers. In the line of motors two No. 20 machines were shown in operation on a Dupont truck, one fitted with nose suspension and the other with cradle. They are each rated at 30 horse-power, and weigh only 14 pounds, the gear ratio being 5 to 1. The motor details were shown in some No. 28 motors rated at 40 horse-power, which were open for inspection. The shells are of cast steel, with laminated poles bolted in, the armatures wound with

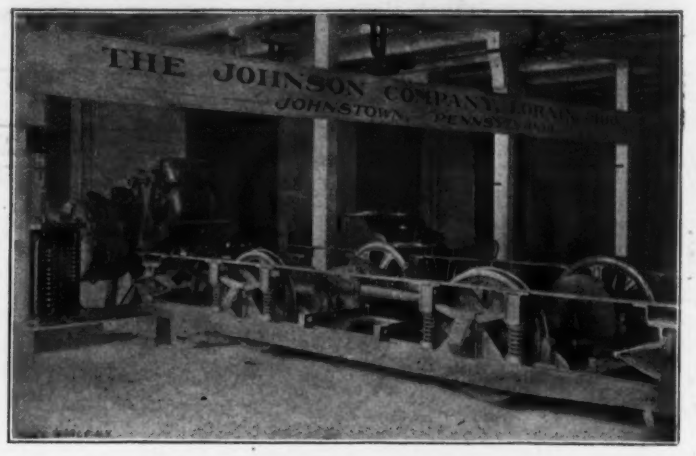
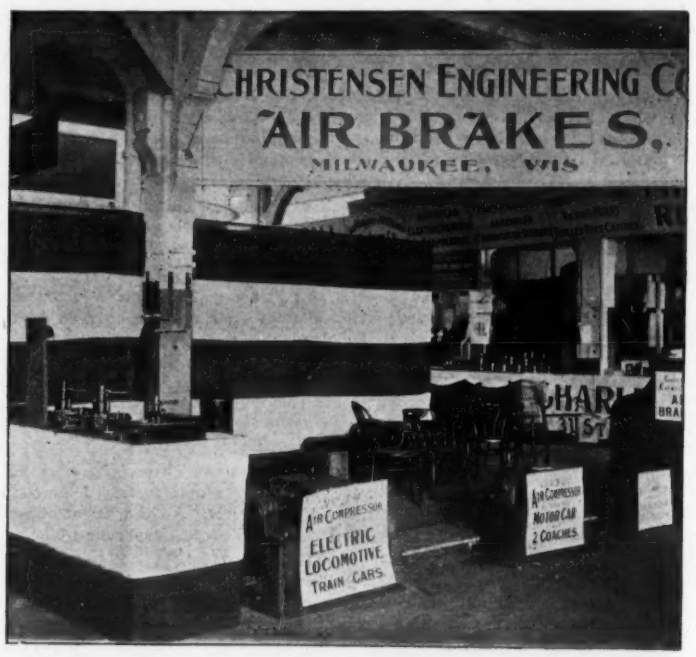


EXHIBIT OF THE JOHNSON COMPANY.

straight out-end connections protected both inside and outside by an iron shield put on after the winding is finished, and screwed to the armature spider. A new No. 34 controller was shown with the reverse switch fitted with positions for cutting out either one or the other motor, and also fitted with a magnetic blow-out without iron in the magnetic circuit, the magnetizing coil being one long loop running the whole length of the controlling cylinder. Car rheostats were also shown, as were several samples of rail and track work. The exhibit was in charge of Mr. J. A. Rutherford, Cleveland sales agent; Mr. E. B. Entwistle, chief engineer, Johnstown works, and Mr. R. Clitz.

THE CHRISTENSEN ENGINEERING COMPANY, Milwaukee, Wis., was the only exhibitor of air brakes, or in fact of power brakes of any kind. It showed three motor compressors of different sizes, piped and wired up in its own exhibit, besides one which was loaned to E. P. Morris for the manipulation of the latter's whistle. The machines in the Christensen exhibit were

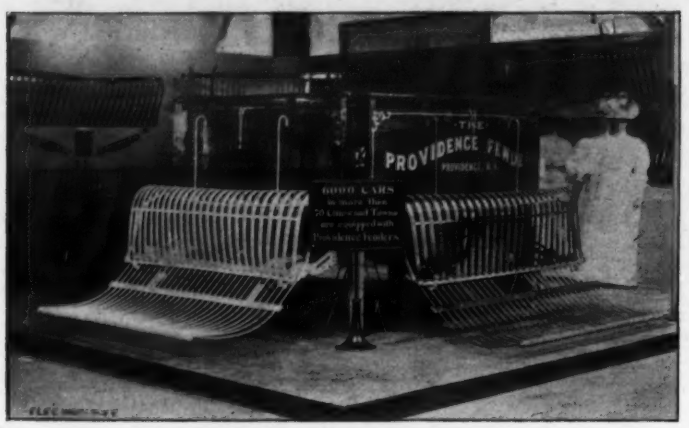


AIR BRAKE EXHIBIT, CHRISTENSEN ENGINEERING COMPANY.

connected to 7-inch brake cylinders through straight air engineers' valves, and were equipped with automatic controllers. There was also shown an automatic three-way valve for the direct system with auxiliary pressure tanks. A souvenir especially gotten up for the convention was a most elaborately illustrated pamphlet describing the application of its air braking system on the Milwaukee Electric Railway & Light Company's system, Brooklyn elevated, Metropolitan elevated, South Side Rapid Transit and many other prominent roads.

THE CONSOLIDATED CAR FENDER COMPANY, Providence, R. I., showed a square platform fitted with three fenders mounted on three of its sides, and a view of which is shown in an accompanying illustration. One

of these fenders is finished in white enamel, one in black enamel and one all polished brass. These elaborately finished fenders were not made for show purposes only, but are in some use for directors' cars, etc. A complete layout of all the parts of the fenders was shown in the exhibit to illustrate to the practical man the care taken in its construction. Briefly, the fender consists of two parts, the pick-up and the cushion. The former runs close to the track and may be dropped until its rubber rolls run upon the track, by means of a trigger under the motorman's control. It is built up of spring tempered round steel rods. The cushion against which a person standing in front of the car would be thrown is constructed of spring tempered steel strips. The other parts are all high grade malleable iron castings. The total weight of a single fender complete is 136 pounds. Several styles of equipment are made, one



PROVIDENCE FENDERS.

contemplating the transfer of the fender proper from one end of the car to the other; another the use of two fenders continuously and the other the use of but one fender at one end, the car always running in the same direction. Col. A. C. Woodworth, general manager of the company, who was in charge of the exhibit, staated that over 6000 cars in this country are now equipped with this fender; 2400 equipments have been ordered by the Metropolitan Street Railway Company, of New York City, alone.

THE LAP JOINT RAILWAY TRACK COMPANY, 11 Broadway, New York, had an exhibit in charge of the designer of the joint, Mr. T. H. Gibbon, formerly assistant engineer of the D. & H. C. Company. By the system being exploited by this company the rail is rolled in two parts, one carrying the head and half the web and one side of the foot; the other interlocking with it and consisting of the other half of the web and the other side of the foot. The joints of the two parts are staggered so that they occur 15 feet apart, giving a more rigid structure at these half joints than if the rail as a whole were discontinuous and joined by tie plates. For street railway work the system is carefully laid out with base plates and tie bars, the whole system being locked together by means of bifurcated wedge-shaped keys which can be driven in and upset, giving no opportunity for loosening by unscrewing of bolts. Girder rails are made up with a box-shaped beam into which a short section of I beam is slipped at the joints. Rails constructed in this way have been in service in Baltimore, New Orleans and Astoria, L. I., for several years with, it is said, no dropping of the joints.

MESSRS. WENDELL & MACDUFFIE, 26 Cortlandt Street, New York, distributed a neat catalogue of machinery and supplies dealt in by the firm. The list is a long one, and includes everything in the way of supplies for electric railways and electric lighting, fan motors, tools, engines, boilers, packing, etc., etc. This enterprising firm believes in keeping abreast of the times.

THE CHICAGO RHEOSTAT COMPANY, Chicago, Ill., had a very able representative in Mr. E. R. Harding. Catalogues distributed by Mr. Harding briefly outlined the main features of the company's motor rheostats, which devices appear to be remarkably simple in design. Two types of automatic starters, ranging from two-thirds to 3 horse-power, and an overload starter of the same capacity, are manufactured by the company.

THE AMERICAN ELECTRIC HEATING CORPORATION, Boston, made a display of its car heaters in the exhibit of Mr. Charles N. Wood. The corporation makes car heaters in seven different sizes and forms. They include forms to screw to the floor or suspend under cross seats; to fasten on front of panel or wall, and a panel type to set into the riser. All the ticket offices, etc., of the Boston subway are heated by American Electric Corporation heaters.

THE RIDGWAY DYNAMO & ENGINE COMPANY, Ridgway, Pa., distributed an artistically designed and illustrated catalogue of its automatic cut-off engines, simple and tandem compound. Simplicity of construction is one of the main features of these engines, and in their design life, economy and smooth-running qualities were carefully and duly considered. The company guarantees that every automatic engine sold by it will not run one revolution slower when fully loaded than when empty.

THE J. G. BRILL COMPANY, Philadelphia, made a specialty of double trucks, showing its centre pivot maximum traction truck, with motor hung outside, the wheel base being only 4 feet and the height only 28½ inches to the sill of the car, with 30-inch wheels all around. The Eureka maximum traction truck, with inside motor and coil springs all round, and the standard double truck, without the maximum traction effect, were also shown. Outside of the building there was on exhibition a new type of convertible car with cross seats, an aisle down the middle and platforms and panels and windows, which are arranged to slide into the roof, these two parts going up beside each other so that the monitor is not cut off. Straight glass is used, the windows being hinged at one point. A standard closed double truck car mounted on Eureka maximum traction trucks similar to the equipments being furnished the Metropolitan Street Railway Company, of New York City, was also shown on a side track near the building. The J. G. Brill Company's interests were looked out for by Mr. John A. Brill, vice-president of the company; Mr. G. M. Hastings, Mr. G. M. Haskell, Mr. W. H. Heulings, Jr., Mr. S. M. Curwen and Mr. W. S. Adams.

THE SHAWMUT FUSE WIRE COMPANY, Boston, had on exhibition no small amount of lead and copper worked into copper terminal fuses suitable for railway work in about all the types, shapes and sizes that a railway man could find use for. A new thing with the Shawmut Company was an inclosed fuse, the inclosure being a fibre tube with asbestos ends, an air space in the centre and a magnesia powder packing to absorb the vaporized lead, the fuse being constructed under the Cartwright patents. The company also showed something new in the way of quick-break switches, a peculiarity of which consists in the use of two blades to each pole bearing on the opposite sides of a single clip instead of two clips bearing on opposite sides of a single blade, as in ordinary switches. The advantage claimed for this arrangement is more radiation on the blades. The switch handle is conveniently arranged below the point of opening so that there is no danger of burning the hands from arcs. The handle when moved first puts tension on a helical spring and then forcibly releases the switch, the spring giving the quick action. The exhibit of the Shawmut Fuse Wire Company was under the direction of Mr. H. P. Moore.

MR. JOHN T. McROY, New York and Chicago, distributed copies of a poem, of which the following is a copy:

BOSTON.

Oh, a queer old town, but a dear old town,
Is the home of the Bostonese.
So modest and kind one expects to find
Pantalettes on the limbs of the trees.

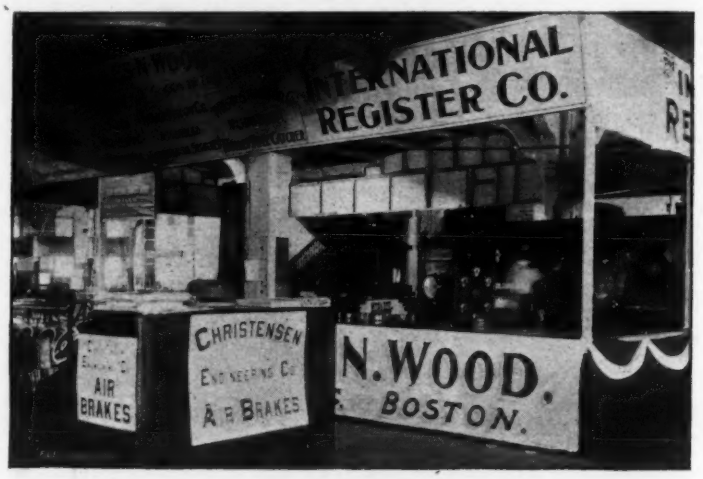
There the owls now hoot in a way astute—
As all well-bred owls should do—
And they plainly say in grammatical way
"To whom" and not "to who."

Once the Kelley "slide" claimed old Boston's pride—
John L. can still command it;
But you mustn't insult her Ibsen cult
By claiming you understand it.

In the paths obscure of freak literature
Her work is certainly crowning;
Boston's flies wear specks and she now subjects
All beans to a course of Browning.

The conclusion of which is that a Boston intellect is not required to install the McRoy vitrified clay conduit. Unskilled labor can do it. It is certain that a Boston intellect is not required to appreciate the merits of a McRoy conduit, since there are now being installed 300 carloads of it in New York City for the Metropolitan Street Railway Company.

MR. CHARLES N. WOOD, Boston, gathered into his large booth exhibits of the extensive line of railway apparatus and materials for which he has the New England agency. Among these are the products of the American Electric Heating Corporation, Cambridgeport; gears and pinions of the R. D. Nuttall Company, Allegheny, Pa.; commutators and segments of Van Wagoner & Williams Hardware Company, of Cleveland, and many others. A novelty to street railway men in Mr. Wood's exhibit was the Wilson patent trolley



MR. CHARLES N. WOOD'S EXHIBIT.

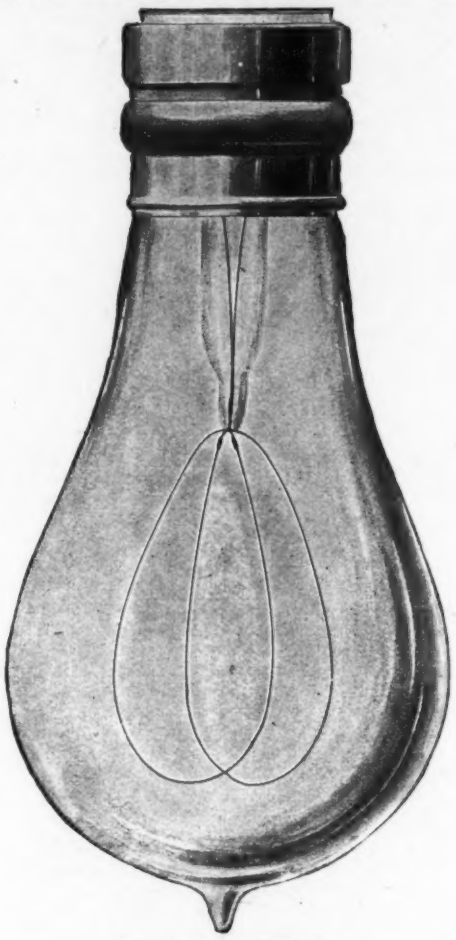
catcher, patented by Wilson, Thomson & Co., of Brooklyn, which catches the trolley rope as soon as it gives a quick jerk upward, preventing the trolley whenever it slips off from rising more than 3 or 4 inches above the trolley wire.

THE FALK MANUFACTURING COMPANY, Milwaukee, Wis., was represented by Mr. E. A. Wurster, secretary and treasurer; Mr. Clement C. Smith, chief engineer, and Henry L. Prather, general sales agent, who were loud in their praises of the new compressed air sand blast for cleaning rail ends before joining them by the Falk cast-weld process. They claimed that the improved action of this blast rendered the surface so perfectly clean that the weld would never slip and never show any appreciable drop. Several joints were shown which had seen four years' service with no perceptible drop and no sign of creeping, showing that when the conditions are right this joint is a perfect one. With the new sand blast these conditions are said to be always attainable. Railway men with old tracks, dropped joints and corroded bonds were buttonholed and instructed in the merits of the track renewal process with which the Falk Company can fix up their tracks as good as new. Rails bent down at the ends can be sprung up again, cleaned and cast together across the joints, the

surface trued by a grinding car to take out old flats and unevenness, leaving the track as good or better than a new one. A novelty now being introduced to the electric railway market by the same company is the auto-motoneer, which is a device for attachment to a controller whereby the operating lever cannot be advanced more than one notch at a time and a predetermined time must be passed before it can be moved up another notch. This is accomplished by an air piston dashpot and ratchet, and it is intended to prevent waste of current in starting cars. The apparatus is the invention of Mr. G. W. Knox, electrical engineer of the Chicago City Railway Company, and from data worked out by him this machine can save with ordinary motormen making 500 stops a day 28-kw hours in the same time, which at 1½ cents per kilowatt hour amounts to $150 a year per car.

A New Car Lamp.

The Lynn Incandescent Lamp Company, Lynn, Mass., has placed upon the market a car lamp which is claimed to meet every requirement in electric car service and to overcome the many deficiencies of lamps of this class. In many of the lamps now in use the filament is liable to bend over and touch the bulb, resulting in the destruction of the lamp. The form of the filament in the new lamp is such that it will throw the light equally in all directions. Each part of the filament forms a corner of a square. The company claims that it is enabled to make the filament shorter and larger in diameter than those of other make and that by the process of its manufacture it can make the filament of a definite diameter, which insures a uniform consumption of current. This is an important feature in lamps which are placed in series, since there



NEW RAILWAY LAMP.

will be continual burn-outs in case one lamp does not carry the same number of amperes as its neighbors.

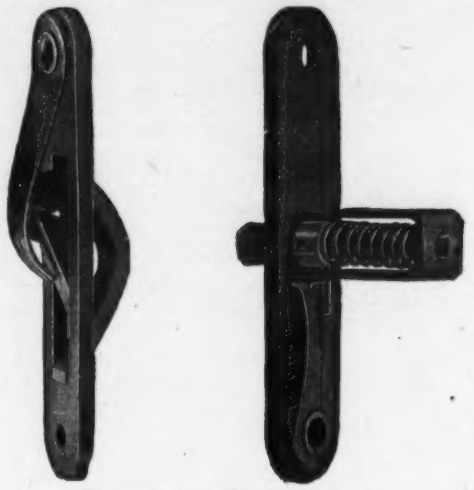
Besides manufacturing this new lamp the company makes a renewed railway lamp, which it sells at about half the price of the new lamp. The lamps are renewed by simply putting a new carbon into the old bulb after the latter has been thoroughly cleaned on the inside. The brass part of the lamp is not disturbed in any way, and the lamp in every respect gives as good satisfaction as a new one, besides being as long lived. The Lynn Company offers very liberal inducements for consumers to test for themselves the value of its renewed lamps, and certainly could do no more to secure for its product a thorough trial in actual use. This company claims to be the pioneer and the largest of the renewal companies.

Improved Burglar Alarm Window and Door Springs.

The devices illustrated herewith, a burglar alarm window spring and a door spring, have just been placed upon the market by Rousseau's Electrical Works, 329 Fourth Avenue, New York City. These springs have been used for a number of years by the inventor, Mr. David Rousseau, in all of his construction work, and on account of the general excellent results obtained by their use there has been quite a demand for them from other contractors.

The Rousseau Company has recently been incorporated, and has purchased all of the patents, tools, plant, etc., belonging to Mr. David Rousseau, and will furnish a full line of his specialties as quickly as it is able to get them in stock.

The springs shown herewith are of a very high grade, being very well finished and made of good heavy brass stock. All the contact springs are made of phosphor-bronze to insure the retention of their springiness, steel and german silver having been found to fail in the course of time. The insulation on the back of the springs is hard rubber and fibre, and that on the face, where the spring is exposed to the weather, is of mica, which, it is claimed, absolutely prevents any short circuiting if the weather beats in through the window frames.



WINDOW AND DOOR SPRINGS.

For the convenience of its customers the company is making arrangements to have all of its products carried in stock by the different leading supply houses.

Improved Trolley Pole.

The Bibber-White Company, Boston, is introducing a new trolley pole, an illustration of which appears herewith. This trolley pole is the invention of Mr. Herbert W. Smith, manager of the street railway department of this company. It is claimed that it is entirely different from all other poles, being made of cold-drawn seamless steel tubing, drawn to a taper and then cor-

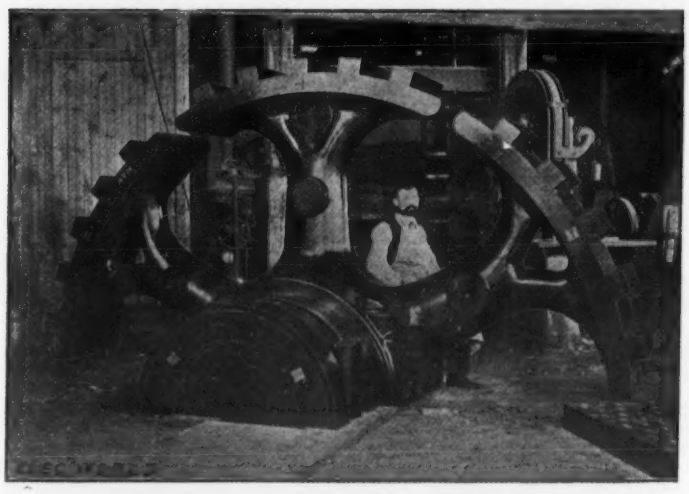
CORRUGATED TROLLEY POLE.

rugated, and that by being corrugated it can be made nearly twice as light as the ordinary trolley pole and considerably stronger. It places less tension on the spring of the trolley base, and therefore less pressure on the trolley wire, thus reducing the wear and tear on the trolley wheel and wire. These poles will be made in all sizes.

The Largest Direct-Current Dynamo in the World.*

BY PROF. S. H. SHORT

The rapid development of electric power for various purposes has made a demand for larger and larger units in the generating stations where this power is produced. A few years ago generators of 100 to 200 kilowatts capacity were considered enormous machines. There soon appeared, however, direct-driven generators of 750 kilowatts, to be used in large railway plants in such cities as Chicago, Boston, St. Louis and Brooklyn. At the World's Fair, in 1893, the



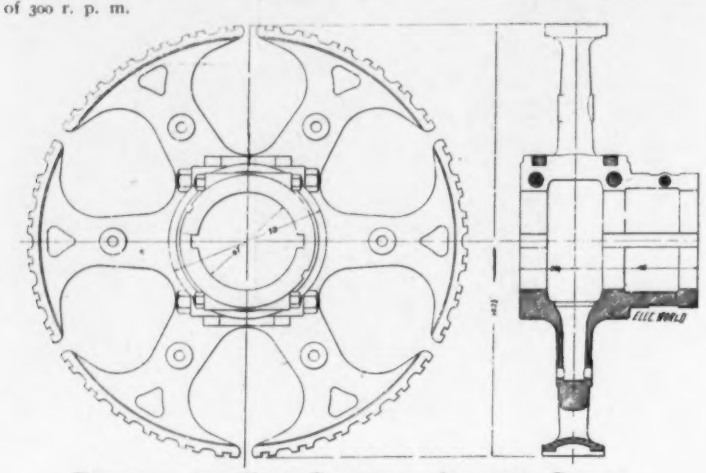
ONE HALF OF THE ARMATURE SPIDER.

first 1500-kw generator made its appearance in the Intramural Railway station. This machine was then considered a monster. This unit was soon adopted for many of the large street railway stations, notably Chicago and Boston, and finally machines of 1600 kilowatts were placed in the Kent Avenue station in Brooklyn. Still later Louisville, Ky., purchased a 2200-kw generator. The Metropolitan Street Railway Company, of New York,

*Reprinted from pamphlet distributed at the Boston Convention of the American Street Railway Association.

has recently placed an order for a number of 2500-kw alternating machines, and but a few months ago the Boston Elevated Railway Company, which succeeded the West End Street Railway Company of that city, gave to the Walker Company, of Cleveland, the order for a 3000-kw machine.

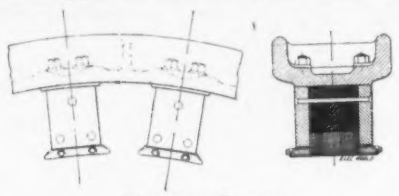
All of these large machines are made to run at the very slow speed of from 75 to 80 r. p. m. It is true that the alternating current machines built for the Cataract Construction Company at Niagara Falls have an output of 5000 horse-power each, while the monster ordered by the Boston Elevated Railway Company has an output of but 4000 horse-power. Nevertheless the 4000-hp machine being built by the Walker Company is much larger than the alternators in use in the Niagara Falls power house, as the speed of the Boston machine is 75 r. p. m., while that of the Niagara machines is somewhere in the neighborhood of 300 r. p. m.



Elevation and Cross Section of Armature Spider.

If the Boston machine were run at the high speed of the Niagara machines its output would be something over three times of the latter, or about 16,000 horse-power.

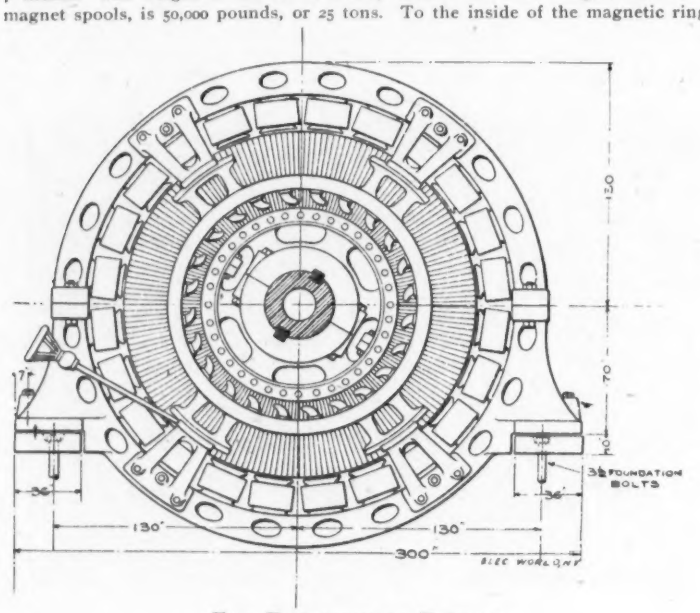
As the construction of this 4000-hp generator marks an era in the development of dynamo-electric machines it may be interesting to electrical engineers and those using electrical apparatus to know its dimensions and general design.



Magnet Cores.

A few illustrations of the Boston generator, together with a short description of its construction and the weights of its various parts, are therefore given.

The total weight of the complete machine is 250,000 pounds. The frame is made of cast steel and is circular in form, the diameter over all being 21 feet 7 inches. The weight of the frame alone, without the field magnet cores for magnet spools, is 50,000 pounds, or 25 tons. To the inside of the magnetic ring



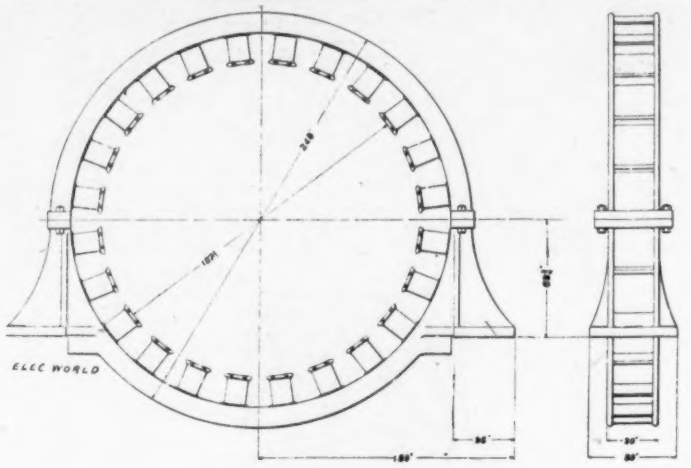
End Elevation of Dynamo.

or frame are bolted twenty-four laminated steel magnet cores or pole pieces, the total weight of which is 30,000 pounds, or 15 tons. The inside diameter of the bore of these pole pieces, completed, is 15 feet 6 inches.

The magnet cores are each provided with magnet spools, wound with shunt and series coils, in the usual way. The pole pieces are arranged to hold the magnet spools in place, and each core is bolted by four 3-inch bolts to the inner surface of the magnet frame.

The magnet frame is divided in halves, on a horizontal plane, and is mounted upon the foundation plates in such a manner that the whole frame may be made to slide lengthwise of the engine shaft far enough to uncover the armature windings, or to allow the individual magnet cores or field spools to be removed without separating the magnet frame.

The armature spider of this machine is an interesting part of its construction. It is made in halves, like the hub of a fly wheel, to be bolted together upon the shaft of the engine after it reaches its destination. If it had been made in one piece no railway car could be found large enough to ship it from Cleveland to Boston. The armature hub weighs 40,000 pounds, or 20 tons, and has an outside diameter before the laminations are in place of 13 feet. After the engine is upon its foundations in Boston this armature spider will be mounted



Cast Steel Field Frame.

upon the engine shaft, which is itself 37 inches in diameter. The laminations which form the armature core, the total weight of which is 30,000 pounds, or 15 tons, will then be built upon the periphery of the armature spider.

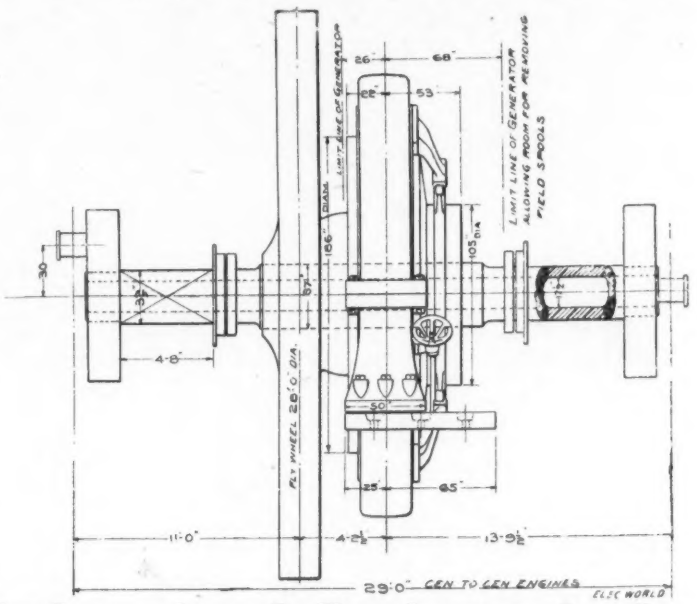
The slotting in the armature laminations will register accurately and provided, when completed, 594 slots. The insulation and windings will then be fitted into the slots and connected with commutator.

The commutator itself is made up of 1188 bars, and is 105 inches in diameter. It is divided into halves for the purpose of shipment and ease of handling, and will be placed upon an extension of the armature hub after the latter is secured to the engine shaft.

The great fly wheel of the engine will be bolted directly to the armature hub near its periphery, in order that the regulating force of the wheel shall not be transmitted wholly through the shaft of the engine. This will relieve the armature shaft and its keys from the enormous strain to which they would otherwise be subjected.

The machine has been most carefully designed, and an unusually large factor of safety provided for every part subjected to mechanical or electrical strain. Because of this the machine will be able to take twice its normal load for short periods of time without injury, and to carry a 50 per cent. overload for several hours.

The greatest care has been taken to secure from the generator a higher percentage of efficiency than has thus far been attained in units of large size.



Side Elevation, Showing Fly Wheel, Journals and Crank Discs.

There seems to be no limit to the capacity to which these large generators can be carried. The development that has taken place thus far is an interesting study in view of what must ultimately come when we are compelled to provide means for transmission of power for those large schemes of propulsion which are awaiting the application of electricity in place of steam.

What will be the limit to the size of machines required when our main line steam railways are operated by electricity?

NEWS OF THE WEEK

Financial Intelligence.

THE BALTIMORE TRUST & GUARANTEE COMPANY is offering $850,000 first mortgage 5 per cent. sinking fund gold bonds of the Knoxville Traction Company, of Knoxville, Tenn. They are coupon bonds of $1000 each, with privilege of registration, and are secured by first mortgage upon all the lines of the Knoxville Traction Company, and are additionally secured by the stock of the Knoxville Electric Light & Power Company and by valuable real estate, power houses, car barns, shops, etc. The bonds are dated April 1, 1898, and mature April 1, 1928.

Special Correspondence.

NEW YORK NOTES.

Office of THE ELECTRICAL WORLD,
9 Murray St., NEW YORK, September 12, 1898.

ELECTRIC TRACTION ON THIRD AVENUE.—It is stated that the plans and specifications for the installation of the underground electric conduit system on the Third Avenue Railway have been decided on, and that the contracts for the work have been drawn. The names of the contractors, however cannot be learned. It is further stated that the electric system will be in operation sixty days after the work of changing over has been commenced. It is the company's purpose to similarly equip the Forty-second Street road, and it expects to have electric cars running on this line before the winter sets in. The 125th Street line will also be changed to the underground conduit system. The Dry Dock line will be changed over in the spring. It is stated that the improvements will entail an expenditure of from $12,000,000 to $15,000,000.

STREET RAILWAY CONVENTION.—During the present week—on Tuesday and Wednesday—the Street Railway Association of the State of New York will meet at Manhattan Beach for the twofold purpose of discussing matters of interest to themselves and the public and inhaling ocean breezes. The first-named object, however, is the primary cause of their invasion of one of New York's most popular seashore resorts. The meeting is the sixteenth of the association, and the executive committee acted wisely in changing the place of meeting from Brooklyn to the seaside. Some excellent papers are down on the programme, and under the stimulating influence of the pure sea air the meetings should be interesting. Among the subjects of papers promised are the following: "Points on the Care of Dynamos," "Low Joints, How to Prevent Them," "The Power Station from an Economic Standpoint," "Track Bonding," "The Most Approved Plan of Long Distance Power Transmission" and "The Effect upon Street Railroads of the Application of Electricity to Steam Roads." "How Can We Increase Our Receipts?" is the suggestive title of another paper. If the author's solution of the problem is capable of universal application his name should be engraved in deep and enduring letters on a solid block of bronze or some other indestructible substance, so that his fame shall be handed down to the millions yet unborn, most of whom will be confronted with the same question at some time of their lives. The association has a live and enterprising president in Mr. G. Tracy Rodgers. This gentleman presides over the destinies of the Binghamton Street Railroad, and he is doing more for the good of Binghamton than any other single factor in its development. He is giving the citizens the best service obtainable from an electric railway, and nothing conduces more to the welfare of an intelligent community than first-class street railway facilities. The Binghamtonians are fortunate in this respect.

HORSE CARS ON BROADWAY.—New Yorkers were treated to a real surprise on Monday morning last, and no doubt many of them rubbed their eyes wondering whether they had been asleep for several years and had just awoke after dreaming that horse cars had been removed from Broadway. The occasion of this exhibition of astonishment was the reappearance of real horse cars, drawn by real horses, trudging up and down the busy thoroughfare, and the cause of this novel spectacle was a peculiar accident at the power station at Broadway and Houston Street. Broadway merchants wondered if the substitution of horse cars for the cable was in the line of progress, and could not understand why the antiquated method of street travel should be so suddenly revived in this enlightened city. Their fears were allayed, however, after a half-day's experience with the new (?) mode of travel, for then the horses and horse cars, for the second time in their careers, were consigned to "innocuous desuetude." As to the accident: It seems that the inner lining of the power house chimney crumbled and fell away from the wall, blocking the outlets of the gases from the fires under the boilers. When Chief Engineer E. A. Pierson looked over the ground he thought that it would be best to take this opportunity to make a general overhauling of the cable plant. Therefore it was decided to suspend operations on the cable system until repairs could be effected to the chimney; meanwhile the engines, etc., were to be overhauled. The plant has been in steady operation for eight years. The machinery was started up again at 1 o'clock in the afternoon, and the cable service on Broadway resumed. The accident to the chimney occurred at 2 o'clock in the morning, and between that time and 1 o'clock in the afternoon all the available horse cars on the company's system were brought into requisition on the Broadway line, and it was during this time that New Yorkers were treated to this glimpse of the past. A great big sigh of relief was given when the cable cars made their reappearance, and a bigger one will be given when electric cars displace the cable cars.

COMMENCEMENT OF WORK ON THE BROADWAY UNDERGROUND CONDUIT SYSTEM.—The Metropolitan Traction Company gave New Yorkers two surprises during the past week. One was a sort of a farewell appearance of horse cars on Broadway and the other was the sudden decision to begin at once the work of installing the underground conduit system on that street. This decision was immediately followed by active work, and at 7 o'clock on Friday morning, September 9, workmen began tearing up the pavement adjacent to the outside rails of the uptown track opposite the Bowling Green Building at the lower end of Broadway. After a narrow strip of pavement had been removed trenches were dug to a certain depth to ascertain what underground obstructions there were to be dealt with. President Vreeland states that the work will be carried on a block or two at a time until the overcrowded portion of the street is reached. It will then be prosecuted at night, when traffic is light and the street is comparatively free of vehicles. The work of installing the improved system of propulsion on the Broadway line will be peculiarly difficult for the reason that the street car service cannot be suspended there as it was on Fourth Avenue, Eighth Avenue, Sixth Avenue and on other streets when similar improvements were made along those thoroughfares. The normal street car traffic on Broadway is extremely heavy, and to interfere with it would be a very serious matter, not only to the public, but to the company as well. The company, however, has never lost sight of the duty it owes to the public, and has always laid its reconstruction plans so as to give the public as little inconvenience as possible. It is stated that the necessary consents of property owners and State and local authorities have been obtained to carry on the work on the Broadway line. It had been the intention of the Metropolitan Company to defer this work until next spring, but the public appreciation of the new electric system, and the fact that the similar work on the Sixth and Eighth Avenues lines has been pushed ahead with so much vigor, induced President Vreeland to have the Broadway work begun at once.

NEW ENGLAND NOTES.

Branch Office of THE ELECTRICAL WORLD,
Room 91, Hathaway Building, 620 Atlantic Ave.,
BOSTON, Mass., September 10, 1898.

THE SUBWAY.—The third and last section of the subway was opened to the public at 5:45 A. M., September 3, when the first car ran underground through the heart of the city. The actual length of the subway is 1 2-3 miles, with a trackage of about 5 miles. There are three junctions by which the surface cars can enter and leave. The cost of the subway, approximately, to date, including material, work, real estate, etc., is $5,786,000. The work of the Rapid Transit Commission has been pushed with considerable vigor, and as a result they have completed the gigantic undertaking more than ten months under the time limit. The ground was first broken by Governor Greenhalge on March 28, 1894.

THE TWENTIETH ANNUAL clambake of the American Electrical Works, Providence, R. I., held Saturday, September 10, at the Pomham Club, is past, and its memories, like those of all other of these annuals, will be indelibly impressed on the minds and in the hearts of over 300 members of the electrical fraternity present. Following as it did the Boston convention of the American Street Railway Association, there were present, of course, large numbers of street railway officials. In attendance it exceeded all other bakes. It was a regular Phillips day, so far as the weather was concerned, and mine host Phillips was never in better humor or spirits. The genial Eugene, his sons Frank N. and E. Rowland, and his affable lieutenants, Sawyer, Remington, Ackerman, Donohoe, Carroll, Waggenseil and others, welcomed the early contingent at the Narragansett Hotel, from which they were conveyed by electrics to the club. The usual sports were indulged in by both old and young, these including shooting, bowling, baseball and football, others contenting themselves by admiring the magnificent club grounds and views of the Providence River. The dinner passed more than pleasantly, and the souvenirs this year were a pretty and unique pipe, case and pouch of tobacco. Dinner concluded, Mr. Phillips rapped to order, and made the neatest speech of his life, likening the twentieth annual to the stock farm, and humorously introducing as thoroughbreds Mr. E. B. Baker, of the Southern New England Telephone Company; A. L. Suesman, an old telegrapher, and W. H. Sawyer, all of whom have attended the full twenty bakes; as high steppers his sons Frank N. and E. Rowland, and as working horses Messrs. Sawyer, Remington, Ackerman, Donohoe, Carroll, Watson, Waggenseil and others of his business and factory staff, finally announcing as toastmaster Major R. S. Brown, of the Boston office of the Westinghouse Electric & Manufacturing Company, who proved to be the right man in the right place. Responses to toasts were made as follows: By Mr. C. L. Van Shyck for "Providence," Mr. T. C. Pennington for the "American Street Railway Association," Mr. Stephen H. Goddard for the "Electrical Press." Capt. William Brophy in general remarks divided honors with Toastmaster Brown. Master Mechanic Baker, of the Boston elevated road, said a few pleasing words, and Gen. C. H. Barney read a humorous poem replete with wit entitled "Finnigan's Repoort." An orchestra rendered excellent selections during the dinner. The bake was a great success, and every branch of the electrical business was represented.

Buffalo and Niagara Falls Notes.

Buffalo, N. Y., September 10, 1898.

THE NIAGARA POWER COMPANY will build a station at once on the Buffalo cable line at North Tonawanda, the contract having been let for about $10,000. From this centre all power will be distributed through Tonawanda and sent to Lockport.

THE BUFFALO STREET RAILWAY COMPANY is so well pleased with the new storage batteries, built to bridge over any sudden strain on the power, as well as to take care of the 6 p. m. peak, that it is preparing to increase the capacity of the plant from 1200 to 2000 horse-power. The batteries, working automatically as they do, add much to the life of electrical apparatus.

THE NEW YORK CENTRAL RAILROAD has met the trolley rates from Buffalo to Niagara Falls and Lockport, and a great increase of steam travel has resulted. This means travel for about a cent a mile. It is believed that the move presages the adoption of the trolley on the line, as has been done on the Erie road from Tonawanda to Lockport, at least so far as substituting electric for steam locomotives is concerned. Were the trolley lines strong enough a war of rates would probably result.

MR. EDWARD BOILLEAU, the electrical consulting engineer who came here a short time ago from Milan to examine our recent electrical improvements and installations, has returned home. He does not hesitate to say that we are in advance of Europe in the use of electricity. Most of his time was spent in looking over our trolley systems. Like all European engineers he was astonished at the extent of our use of passenger elevators or "hoists" in buildings. Europe has nothing to compare with it.

THE SMITH LINES, Buffalo to Tonawanda inland, inside Tonawanda, and Buffalo to Tonawanda, via the Niagara, and with extension to Niagara Falls in prospect, have been reorganized with State Comptroller James A. Roberts as president. Many large capitalists have been added to the board of directors. The latest move made by the combination is to cover the resorts on Grand Island with a trolley line, reaching the island by a car ferry till the new bridge is finished. This will insure possession of the island in advance of the bridge.

THE FOURTH electric generator in the Niagara power house stands ready to do duty at a moment's notice, and is operated whenever the load runs high, The Westinghouse authorities state that the average load carried at the tunnel is now 16,000 horse-power. Of this the amount coming to Buffalo and under contract to be brought here as soon as possible is 4600 horse-power. There is a report that new contracts are to be closed very soon. With the tunnel load running up to 17,000 horse-power occasionally it will be necessary to get the fifth 5000-hp machine ready before long to avoid accidents.

THE VISIT, this week, of Secretary W. B. Rankine, of the several Niagara tunnel companies, to Toronto reveals more completely than ever the bluff that certain Canadians were putting up last year against the companies. Mr. Rankine is secretary of the Canadian company also, which has two 500-hp generators in the power house of the Victoria Park & River Railway Company, put in mainly to stop the clamor and threats of agitators to set up a competing plant or annul the Canadian grant to the company. Mr. Rankine states that only a trifle over half of the small amount of power available has been taken. The local lighting plant takes 250 horse-power, the Canadian branch of the Carborundum works 200, and the Carmelite Monastery seventy. So the company is looking to Toronto for an outlet. This city is about 85 miles from the tunnel by land or 50 miles across Lake Ontario.

TROLLEY LINE EXTENSIONS appear to have become epidemic in this vicinity. The latest move is in the interest of a general consolidation of all lines in Niagara County; that is, all of the lines run by power from the Falls. This would form a large system, and if carried through will require a considerable time to perfect arrangements. It is said that President Ely, of the Buffalo & Niagara Falls and the Buffalo & Lockport roads, favors the scheme, and that the Canadian line at the Falls will enter such an alliance, which is probably about all that can be accomplished at present. One obstacle is the State reservation at Niagara Falls. It is an inflexible law of the commissioners not to allow a trolley line to cross the grounds. This separates the Canadian road from the lines on this side of the new bridge by a few rods. It is given out as already arranged that as soon as the bridge from Lewiston to Queenston is finished a belt line, made up principally by the Canadian and the Gorge roads, will be established.

Milwaukee Notes.

Milwaukee, Wis., September 8, 1898.

AT LITTLE FALLS, MINN., a committee has been appointed to secure plans and estimates for a municipal lighting plant.

THE FOX RIVER ELECTRIC RAILWAY COMPANY, of Green Bay, has asked the De Pere Council for permission to extend its line into the latter city.

MESSRS. C. N. FALK and T. B. Gibson, of Milwaukee, are taking preliminary steps for the construction of an electric railroad betwen Baraboo and Devil's Lake, a distance of 20 miles.

St. Louis Notes.

St. Louis, Mo., September 8, 1898.

STRIKE RIOTS.—Two riots were caused by striking linemen in North St. Louis a few days ago. In both instances pistols were used, and several men were hurt. The police were called in and arrested the disturbers.

THE WINSTANLEY PARK Board passed a vote last week declaring the Day line tracks a nuisance and wants them removed. The vote stood five to one in favor of the Suburban line. There is a very bitter fight on between the two lines.

ST. LOUIS TELEGRAPHERS have formed an association known as the St. Louis Telegraphers' Aid Society. The officers are: President, A. E. Van Tyne; vice-president, M. A. Hawley; secretary, W. J. Armstrong; treasurer, R. H. Bohle; executive committee, J. M. Maddox, W. H. Spencer, Charles McNeill, M. Tully, J. B. Magill; auditing board, J. A. Weaver, H. C. Crain, C. W. Groos.

DEFECTIVE FRANCHISE.—The Suburban road, which was granted a franchise to build an extension north on Sarah Street and the St. Louis & Meramec River road, finds that it will require a franchise along a small part of Euston Avenue. The Suburban tried to secure a permit from the Board of Public Improvement, but that body denied it on the ground that the Assembly alone could remedy the defect.

TELEPHONE REMOVAL.—The operating office of the American Telephone & Telegraph Company, better known as the Long-Distance Telephone Company, has been removed to Madison, Ill. Trouble with the underground system of cables in the city is assigned as the reason for the move. A first step was taken last week, when the local offices at 410 Olive Street were vacated and moved into temporary quarters on Ferry Street, at the west end of the Merchants' Bridge.

THE LINDELL RAILWAY COMPANY has completed its arrangements for the wholesale extension of its lines into St. Louis County. Four different extensions are to be built, that will connect at various places and make one immense electric system. The first will be to lay tracks from a point on the Forest Park Highlands line to a junction with the Forest Park & Clayton line. Another will start from the same point, south to Shady Side, near Webster. Two branches will also be built to Creve Cœur Lake.

ELECTRIC ROAD TO JEFFERSON COUNTY.—Within the next few days the St. Louis, Fenton & Southwestern Railroad Company, with a capital stock of $1,000,000, will be incorporated. Thomas F. Sneed, general superintendent of the Suburban Railroad, will be president of the new company. The company will build 44 miles of electric road, to run from the city limits, southwest to Ware, a point four miles south of Morse's Mills,, in Jefferson County. It will parallel the Iron Mountain Railroad the entire distance. Work will begin some time this month. The third-rail system will be used. The line will do both a passenger and freight business.

THE WESTERN ELECTRIC COMPANY, of Chicago, filed suit in the United States Circuit Court Tuesday for an injunction against the Kinloch Telephone Company, enjoining it from using and making a certain multiple switchboard for telephone exchanges. The plaintiff states that Leroy B. Firman, patentee, sold to it the exclusive right to the invention on January 7, 1881, and that it has been manufacturing the switchboard. It claims that the courts authorized a decree of perpetual injunction on March 29, 1898, in the case of the Western Electric Company, against the Capital Telephone & Telegraph Company, of Sacramento, Cal., the latter company being charged with infringement.

Pacific Coast Notes.

San Francisco, Cal., September 4, 1898.

A FRANCHISE was recently applied for in Oakland, Cal., which may be taken as meaning that the Southern Pacific Railroad Company is about to change its cable roads on Telegraph Avenue and on San Pablo Avenue to electric car lines. Permission was asked to operate electric street cars on the above thoroughfares.

THE SUPREME COURT recently affirmed the judgment of the lower court in denying a petition of the People's Mutual Telephone Company, of San Francisco, for a writ of review against the Board of Supervisors. The company objected to the board's action in exacting from bidders for the telephone franchise that they should have at least 2000 bona fide subscribers on their books.

THE SUNSET TELEPHONE & TELEGRAPH COMPANY recently completed its northern extension from Spokane, Wash., and will continue construction northward. The Spokane & British Columbia, which was the first company to introduce telephones in that part of the State, contemplates meeting this action by installing an exchange in Spokane and constructing long-distance lines. It is said that the Sunset Company uses annually 175,000 cells of battery.

THE VITAX BATTERY COMPANY, of San Francisco, has been incorporated by Herbert P. Thayer, Edward H. Baxter, Andrew White and Scott Calhoun. The capital stock is placed at $10,000. The factory has been located, with a capacity of 600 cells a day, at the San Francisco Electrical Company's place, at 31 Second Street, but a much larger factory on Mission Street will soon be in operation. The company has on the market a good line of dry batteries of various forms, and as the freight from the East is 6 cents per cell its prospects are good.

THE CITY OF HEALDSBURG, Sonoma County, Cal., has awarded contracts for the construction of an electric light and pumping plant to the California Bridge Company. The figures as reported are $31,643 for the electric system and $31,700 for the water-works system. It is understood that Stanley electrical apparatus will be installed for the 8-mile transmission at 10,000 volts. The three-phased generator will have a capacity of 120 kilowatts. There will be a 30-hp induction motor, which will drive a triplex pump. City bonds are expected to supply the money required.

THE ELECTRIC LIGHTING AND POWER SYSTEM of the Commercial Light & Power Company, San Francisco, has been quietly transferred to the San Francisco Gas & Electric Company. The former company was organized many years and supplied about 12 miles of shaft service from its steam plant on Commercial Street for printing offices, sidewalk elevators, etc. During the past two years electric service has been given, a Stanley two-phase plant being in use. The circuits have been extended of late, resulting in a profitable sale to the larger company. The San Francisco Gas & Electric Company is still operating the electric plant, but will shut down the shaft power system and supply the patrons of the old company with electric motors and current from its main plant. Consumers will be required to buy the motors.

THE BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY'S 12-mile electric transmission, at 10,000 volts, recently went into operation. The generating station is located on Goldstream, where there is an effective head of 640 feet of water. Two 360-kw Canadian General Electric generators are driven by two Pelton wheels, which are directly connected. The load supplied for the use of the tramway company is about 300 horse-power, leaving a surplus for lighting and other purposes. The Esquimault Water Company constructed the pipe line. The electrical construction was from plans prepared by Hasson & Hunt, of San Francisco. The construction work was begun and nearly completed by Mr. Wynn Meredith, of the above firm, and the plant was completed and tested under the personal supervision of Mr. W. F. C. Hasson.

CANADIAN NOTES.

OTTAWA, Ont., September 10, 1898.

MR. L. V. EMERSON, of Baltimore, who has been here for some time making preparations to give a test to his machine for converting sawdust into carbon, from which to manufacture calcium carbide, made a first test last week. The results are said to have exceeded even Mr. Emerson's sanguine expectations, and have proved an unqualified success.

MR. GEORGE JOHNSON, the Dominion statistician, has been looking into the railway statistics of Canada. He has reported that for the year ending December 31, 1897, there were thirty-five electric railways in the different cities of the Dominion, having a total of 583 miles of track. They ran about 26,500,000 car-miles, and carried fully 84,000,000 people during the year. For the year previous the figures were ten millions less, while the steam railways carried only 16,000,000.

THE TWENTIETH CENTURY MOVEMENT has reached Toronto, Ont., in the form of a coach delivery wagon, to be used by the Robert Simpson Company, of that city. The propelling power of this vehicle consists of two 2-hp motors, one geared directly to either hind wheel, which admits of the wagon turning corners, turning around, and performing such functions without causing friction loss by one wheel revolving faster than the other. The current is obtained from storage batteries with sufficient capacity to run the vehicle from 20 to 35 miles, according to weather and roads. The batteries are arranged in four groups, and are so arranged as to allow them to be charged directly from any electric light wire. The peculiar form of gearing on the wagon is made of composite metals and rawhide, rendering the running of the vehicle positively noiseless. This is the first electric delivery wagon in the Dominion of Canada.

MONTREAL, Que., September 10, 1898.

AN EFFORT is being made to organize a new telephone company in London, Ont. A number of local capitalists are interested.

THE METROPOLITAN STREET RAILWAY COMPANY, Toronto, Ont., is reported to be considering the extension of its road to Schomberg.

THE CENTRAL ELECTRIC LIGHT COMPANY, Portage La Prairie, Man., contemplates putting in a telephone exchange in opposition to the present company.

THE DIRECTORS of the Brantford Electric Light Company have instructed their manager, Mr. Wyse, to proceed at once to purchase the necessary plant for the extension of the works.

THE BRANTFORD ELECTRIC & OPERATING COMPANY, Brantford, Ont., will expend the sum of $10,000 in putting in a new plant, having received the contract for street lighting for ten years.

THE CITY ELECTRICIAN of Halifax, N. S., has submitted a report to the Council, showing the probable cost of lighting the city by a municipal plant. The question of installing the same will be considered at an early date.

A LOCAL COMPANY in Winnipeg announces its intention to utilize a part of the water power of the Winnipeg River. The project includes the building of an electric railway from the mouth of the Whitemouth River to points on the Winnipeg River.

THE ELECTRIC LIGHT and Water Works Committee at Barrie, Ont., have reported to the Town Council in favor of installing a municipal electric plant, and recommending that a vote of the ratepayers be taken on a by-law to provide $35,000 for the purpose.

IT IS BELIEVED that the deal for the purchase of the Niagara Central Railway by an American syndicate will be concluded. Messrs. Loss, of Buffalo, and Gibbs, of New York, representatives of the syndicate, were recently in St. Catharines looking over the ground with a view to converting the road into an electric system and extending it to Port Dalhousie and Beamsville.

FRENCH NOTES.

(From Our Own Correspondent.)

PARIS, August 15, 1898.

ELECTRIC LIGHT FOR THE FRENCH ACADEMY.—At last the academy is to be lighted by electricity. For some days the Mazarin Palace has been turned upside down by gangs of workmen, who are removing the gas fixtures from the rooms and corridors. Before long every vestige of the antiquated method of lighting will have disappeared.

AN ELECTRIC RAILWAY FOR THE GREAT ST. BERNARD MOUNTAIN IN SWITZERLAND.—Travelers are soon to be carried to the top of the Great St. Bernard by electric power. It has been estimated that 150,000 persons will travel from Aosta, in Italy, to Marigny, in Switzerland, over this route. When the road reaches the high altitudes, sheds and protective walls will be built to prevent land slides and other accidents. Power will be taken from the numerous mountain streams of the Great St. Bernard. The enterprise is backed by English capital.

ELECTRICAL TRACTION AT THE ORLEANS DEPOT (PARIS).—The Orleans Company has submitted to the Minister of Public Works the plans which it has made for the railway service from the Austerlitz bridge to the Quai d'Orsay. Electrical traction will be used, and the change of engines, which will require two minutes, will take place at the Austerlitz station. The steam locomotive will give place to an electric locomotive of 700 horse-power and weighing 45 tons. These machines ride on eight wheels, driven by four 125-kw motors. One locomotive will drag a train weighing 250 tons at a speed of about 30 miles per hour. The current is to be supplied through a third rail. The power station at Ivry will have two sets of 1000-kw machines, supplying three-phase currents at 5500 volts. The currents will be transformed to direct current at 550 volts at two sub-stations, from which it will be delivered to the line. A special 450-volt circuit will be used for lighting purposes.

THE SMOKE NUISANCE IN PARIS.—The official "Municipal Bulletin" has published an ordinance emanating from M. Blanc, chief of police, requiring proprietors of factories in Paris to make such changes within the next six months in the arrangement of their chimneys as are necessary to prevent the escape into the air of the heavy black smoke which contributes so much to the production of what is so justly complained of under the name of "Paris smells." The ordinance reads as follows: "Article 1. This ordinance, to take effect six months from date of publication, hereby prohibits the production of heavy, black and continuous smoke, capable of reaching neighboring houses or of polluting the atmosphere of the streets of Paris. Article 2. Infractions of this ordinance will be duly reported and brought before the proper court. Article 3. The chief inspector of machinery and power plants of registered establishments, and his assistants, the mining engineers detailed to inspect steam plants, and their assistants, are held responsible for the enforcing of this ordinance, which will be published and posted." The continual increase in the number of furnaces using large amounts of coal has made this measure unavoidable. The committee on hygiene, the committee on odors and the Municipal Council have each notified the chief of police that the great quantity of smoke is polluting the atmosphere and blackening and corroding the exterior of the houses in the factory districts. M. Blanc alludes to this in the preamble to his ordinance, and he also calls attention to the methods whereby factory owners and managers may minimize or even completely suppress the nuisance in question; these are by giving greater height to chimneys, by exercising care in the choice of proper fuels, and the use of smoke-consuming apparatus.

MARSEILLES TRANSMISSION OF POWER PROJECT.—The purpose of the Costa enterprise, which has been engrossing the attention of the Marseilles Municipal Council, is to develop on the Durance a water power of 20,000 horse-power to be transmitted by electricity to the city. A canal along the left bank of the river, between the Mirabeau and the Pertuis bridges, will deliver water to the wheels. Four dams will be built, with a generating station at each. The power will be transmitted electrically to three receiving stations at Saint-Louis Malpasse and Pont-de-Viviaux in Marseilles. The voltage at the receiving stations will be 3000 volts. The receiving stations will be connected with the trunk line of the system by feeders. The latter, as well as the former, will be underground. Branch conduits will connect the lines with the customers. The service taps will be made through transformers, and the pressure reduced to 110 volts for interior use. Motors will be connected in parallel on the branch circuits. The total power distributed will come to 12,500 horse-power, reckoned at the pulleys of the consumer's motors. The Municipal Council when granting M. Costa permission to lay conduits in the streets made him amenable to the conditions and details of the Public Works bill, passed in 1895, which covers in a general way all permits for laying conduits in the public streets for electrical distribution. It follows, therefore, that M. Costa's franchise cannot in any way become a monopoly, and that under it he cannot engage in a lighting business, either directly or indirectly. The concession is for thirty years. Current for power will be sold either by meter or for a contract price, according to the wishes of the customer. The company is obliged to furnish power to any person requesting it who is within a radius of 600 feet of the company's mains. It is also obliged to furnish all persons who are willing to contract for an amount of power to cost double the expense incurred by the company in connecting them. It is estimated that in round numbers 20,000,000 francs will be the cost of the entire installation. The project will be submitted to the Minister of Public Works.

General News.

THE TELEGRAPH AND TELEPHONE.

EDINBURG, IND.—The Citizens' Telephone Company has been organized with a capital of $1500. The incorporators are August W. Winterburg, N. Mowney and W. H. Bowman.

NACOGDOCHES, TEX.—This city is soon to have direct telephone connection with Shreveport, which is about 100 miles northwest. The line is being rapidly constructed from here, and has passed the towns of Appleby, Garrison, Timpson and Teneha, going next to Logansport.

HENDERSON, KY.—Articles of incorporation for the Henderson Telephone & Telegraph Company have been filed. It is capitalized at $15,000. The officers are Aaron Waller, president; O. W. Rash, vice-president; O. P. Dyer, secretary and treasurer. A new exchange is to be built in this city immediately, which will give Henderson two systems of telephone.

SIOUX CITY, IA.—The Iowa Telephone Company has begun improvements on its Sioux City plant, which will not be finished until about January 1, next year. The cost will be over $50,000, and will amount almost to a rebuilding of the exchange. Manager Clark says the Sioux City plant and Minneapolis plant will be twins and the finest west of Chicago.

BOSTON, MASS.—It is reported that the Bell Telephone Company has recently advised its licensees that it will hereafter waive the commission that these licensees have been paying the parent company on long distance telephone and telegraph business. This concession, it is stated, will be equivalent to $30,000 annually to the New England Telephone & Telegraph Company, and $50,000 to the Erie Company.

OTTUMWA, ILL.—Articles of incorporation were filed for the Ottumwa Long Distance Telephone Company, of this city, with Jay C. Goddard, A. H. Cowdery and P. E. Wilcox, all of this city, and who are also interested in the Ottumwa Telephone Company, as incorporators. The capital stock of the

new corporation is placed at $60,000. The following named gentlemen are the officers: President, Jay C. Goddard; vice-president, P. E. Wilcox; secretary and treasurer, A. H. Cowdery.

ROCHELLE, ILL.—The Lee County Telephone Company has just completed its system by putting in a line from Steward to Lee and from Lee to Paw Paw, which furnishes a complete circuit of the county. It is said that this county has the most complete system of any county in the country outside of large cities—having no less than fourteen exchanges, viz.: Dixon, Eldena, Amboy, Harmon, Shaw, Sublette, West Brooklyn, Lee Centre, Compton, Paw Paw, Lee, Steward, Ashton and Franklin Grove; also toll stations at Grand Detour, Nachusa, Walton, Gap Grove, Prairieville and Flagg; also on the lines between exchanges, making a total of nearly 450 telephones in the county.

BOSTON, MASS.—The Boston News Bureau says that the independent telephone companies in Minnesota have during the past three years constructed a system of long distance lines connecting points not reached by the Northwestern telephone system operating in that State. Notwithstanding the fact that the Northwestern system owned and operated 7000 miles of wire the independents had built to nearly 300 points not reached by the Northwestern, using fully 2200 miles of wire. The Northwestern Company has closed a contract whereby it secures by purchase 900 miles of this line and enters into an operating arrangement with the balance, all of which are to be equipped with Bell instruments, and the lines and stations become a part of the extensive Northwestern system controlled by the Erie Telephone Company. The result of the purchase and agreements increases the Northwestern toll line system to nearly 10,000 miles, and as soon as the new lines can be equipped with Bell instruments 300 stations will be added to the general system. The arrangement, it is stated, saves the Northwestern Company an expenditure of $200,000, representing the cost of lines into a territory already developed, and gives Minnesota, together with the Northwestern Company system, the most complete long-distance telephone system in the United States to date. The lines acquired that are single grounded circuits the Northwestern will make metallic. This transaction gives to the Northwestern Company the entire toll line system in Minnesota.

Electric Light and Power.

WINONA, MISS.—E. R. Blackstone & Co. propose to put in an electric plant.

LONDON, ONT.—Fire destroyed the London General Electric Company's power house. The loss will be $25,000.

WEST BAY CITY, MICH.—At the Council meeting it was decided to purchase a 1500 dynamo light for incandescent lighting to add to the present city lighting plant.

MINNEAPOLIS, MINN.—A resolution was referred to the ways and means committee of the Council providing for the sale of $300,000 in bonds for the establishment of a municipal lighting plant.

RICHLAND CENTRE, WIS.—The City Council is contemplating the erection of an electric plant for the purpose of lighting the streets of the city, and a committee, consisting of T. Breedon, W. A. Breedon and H. B. Stevens, has been appointed to receive proposals.

CHEYENNE, WYO.—The Buffalo Manufacturing Company, capital stock $30,000, has filed articles of incorporation, and will engage in the manufacture of flour and put up electric light works at Buffalo, Wyo. The incorporators are C. J. Hogerson, W. J. Thom and E. D. Metcalf.

KOKOMO, IND.—On the application of Frank E. Snow, of Indianapolis, a receiver was appointed for the Citizens' Light & Power Company of this city, the petitioner being president of the corporation. Mr. Snow holds a claim of $61,000. Charles Willitts, of Kokomo, was made receiver. The company is capitalized at $75,000, and was supplying street electric light at $70 per lamp for night service.

FOSTORIA, OHIO.—Samuel R. Bullock, of Philadelphia, has purchased the plants of the Fostoria Light & Power Company and the Northwestern Ohio Natural Gas Company. He proposes to erect a plant in the southern part of the city for the manufacture of fuel and illuminating gas and electric light, removing the plants already purchased to that location on completion of the new plant, which will be about November 1.

FORT WORTH, TEX.—The property and effects of the Standard Light & Power Company, of Fort Worth, have been placed in the hands of a receiver. The court appointed Mr. John M. Scott as receiver. The company has been doing business in this city for five or six years, and its plant is valued at about $20,000. The receivership is the result of trouble among some of the stockholders regarding the legality of certain stock transactions.

MONTREAL, QUE.—Mr. D. Harrison, a baker of this city, has devised a means for supplying his horses with an early breakfast each morning with more regularity than he has been able to obtain from a sleepy stable hand. From a clock in the kitchen he carried an electric circuit, which at the stable end operates a magnet in such a way as to release a gallon of oats from the bin placed over the stalls. When the hands of the clock reach the predetermined hour the circuit is closed and the mechanism releases the oats and the horses get their breakfast on time.

PHILADELPHIA, PA.—Henry J. Hartley and twenty-three other stockholders of the Penn Electric Light Company filed a bill in equity against the company, J. Lowber Welsh, Thomas Dolan, William Wood, Richard Brock, Clement B. Newbold, George W. Hill, John Boyd and A. J. DeCamp, individually and as trustees of the "Electric Trust of Philadelphia," asking that the defendants be ordered to make discovery in certain transactions, and account for profits alleged to have accrued to them. The litigation follows in its general outlines other similar proceedings previously brought. The complainants, as minority stockholders of the Penn Electric Light Company, aver that some of the defendants obtained a controlling interest in the corporation, and used its underground conduits, which were its principal property, in a manner other than for the best interests of the stockholders, by allowing some of them to remain idle, and entering into contracts by which the control of the other conduits was given to the Edison Electric Light Company, the Pennsylvania Heat, Light and Power Company and the Pennsylvania Manufacturing Light and Power Company.

The Electric Railway.

BANGOR, ME.—The management of the Lewiston, Brunswick & Bath electric road has purchased the extensive property in Bath known as the old Patten Car Works, more recently the Addison oil-cloth factory. The buildings will be fitted up as general car barns and also repair shops for the road. All the mechanical work in the way of reconstruction and repairs will be attended to at Bath.

PITTSBURG, PA.—R. L. Mayfield, of New York, representing a syndicate of New York, Philadelphia and Pittsburg capital, organized for the purpose of building electric roads in Porto Rico, was in Pittsburg a few days ago. He was on his way to St. Louis to consult with the manufacturers of street cars, and will return to Pittsburg to look after material for the construction of the line. He said that the syndicate had ample capital, but as yet had not secured a charter. Mr. Mayfield declined to give the names of the men in the syndicate.

HARRISBURG, PA.—A charter was issued by the State Department to a party of Philadelphia capitalists to build a trolley line from Hatboro to Horsham, a distance of 1¼ miles. The company is capitalized at $6000, and expects to begin operations this fall. Magnes Hellstrom, of Philadelphia, is president of the concern. The directors are James Crawford, Alfred R. Gandy and Magnes Hellstrom, Philadelphia; S. Edward Hagar, Doylestown, and John B. Peddle, Woodbury, N. J.

NEW YORK, N. Y.—The Brooklyn Heights Railroad Company will soon apply for a franchise for Sixteenth Avenue from Forty-ninth Street to Eighty-sixth Street in Brooklyn. This will be the first application for a right of way in Brooklyn made under the new city charter. The Municipal Assembly will, according to the restriction of the charter, be able to grant a franchise for only twenty-five years, and will have to exact from the Heights Company a suitable compensation for the privilege of using the street. The Brooklyn Heights Company needs a right of way through this part of Sixteenth Avenue to complete its route from the Greenpoint and Eastern District ferries to Bensonhurst. It evidently has confidence that it can get the desired right of way, as it is proceeding to lay tracks in Avenue C, which is the eastern part of the new connection.

PLAINFIELD, N. J.—The New Brunswick Traction Company, which obtained a franchise some time ago to extend its line from Bound Brook to Dunellen, saved the franchise at the last moment by a close call. The franchise required that the line should be running by August 30, but the track is not yet all laid, and one of the bridges is only partly finished. The two miles of track that is anyway passable is the part in Dunellen, where it joins the Plainfield trolley tracks. The New Brunswick Company had no cars, and borrowed an old flat car from the Jersey Central Railroad. It was "launched," a team of horses attached, and the New Market Band and Borough Council got on board. Borough Councilman Snyder, of Dunellen, wore the conductor's cap, and Constable Wyhnsky was the "motorman" who drove the horses. The two miles were made in two hours, finishing just before the fatal hour of midnight. Part of the time the car was off the track, but all hands turned to and set it on again.

Legal Notes.

THE THOMSON-HOUSTON ELECTRIC COMPANY V. THE UNION RAILWAY COMPANY.—An injunction was filed August 19, 1898, in the Circuit Court for the Southern District of New York, restraining the Union Railway Company, of New York City, from using overhead underrunning switches, infringing the claims of the Van Depoele patent No. 424,695.

THE TRIUMPH ELECTRIC COMPANY, Cincinnati, Ohio, writes that the Westinghouse Electric & Manufacturing Company brought suit against it for alleged infringement of patents, but that Judge Clark, of the United States Court for the Southern District of Ohio, not only rendered a decision in favor of the Triumph Company but declared as void the patent on which the Westinghouse Company based its claim.

THE SPRAGUE ELECTRIC RAILWAY & MOTOR COMPANY V. THE CAMDEN & SUBURBAN RAILWAY COMPANY.—An injunction was filed August 17, 1898, in the Circuit Court of the United States, Newark, N. J., restraining the Camden & Suburban Railway Company, Camden, N. J., from using Walker motors, infringing the second and sixth claims of the Sprague patent on spring suspension, No. 324,892. The injunction was suspended for thirty days to give time for replacement of the motors.

Personal Note.

MR. W. D. WEAVER, who was an ex-naval officer before entering the electrical field, and who entered the service during the recent war, expects to return to his electrical duties about October 1. He is now chief engineer of the refrigerating supply ship "Glacier," which is at present distributing a cargo of supplies to the various camps in Porto Rico and Eastern Cuba. When this cargo is entirely discharged the ship will return north, and Mr. Weaver will probably then leave the service.

Trade and Industrial Notes.

THE LONG-BURNING W. E. Petite inclosed arc lamp, manufactured by the Western Electric Company, is now made in three styles, plain and ornamental, with porcelain shades, and plain, with metal shades, for factory and outdoor use.

THE JULIUS ANDRAE & SONS COMPANY, Milwaukee, have just issued

a revised price list of Andrae incandescent lamps. A copy will be mailed to anyone interested upon request. The new telephone catalogue will be ready for distribution within a fortnight.

THE WESTERN ELECTRIC COMPANY has recently issued a very neat forty-page pocket catalogue on linemen's construction tools. A large supply of tools is always carried in stock, and orders can be filled promptly. A copy of this catalogue will be mailed upon request.

THE EMPIRE, one of Milwaukee's finest restaurants and cafés, is being equipped throughout with Lundell electric fan motors by the Julius Andrae & Sons Company. The Sprague goods are very popular in the Cream City, nearly all large and first-class hotels being equipped with Lundell fans.

THE CENTRAL ELECTRIC COMPANY, Chicago, is headquarters for all of the mica products, including mica, mica segments, micanite segments, micanite cloth, empire cloth and M. I. C. compounds. These goods in all the various forms are carried in Chicago stock, and can be supplied immediately.

MESSRS. MEYSENBURG & BADT, 1504 Monadnock Block, Chicago, report a large increase in the sale of Ward Leonard Electric Company's circuit breakers, rheostats and dimmers in their territory. High-grade material and the best of workmanship are principal factors in the production of these goods.

THE GOULDS MANUFACTURING COMPANY, 16 Murray Street, New York, has issued a partial catalogue of Goulds triplex electric power pumps. It is well illustrated with cuts, showing views of actual installations and machines of different capacities. Complete and special catalogues can be had on application.

THE PEERLESS RUBBER MANUFACTURING COMPANY, 16 Warren Street, New York, has just issued a handsome colored lithograph of the United States battleship "Oregon," calling attention to the fact that this ship was fitted in all her joints with "Rainbow Packing," "Eclipse" gaskets, and that her piston and valve rods were packed with Peerless packing.

THE FRANCO-AMERICAN COMPANY, Incorporated, 163 Washington Street, Chicago, is prepared to represent American firms at the Paris Exposition of 1900. It has secured a portion of the American section for its own patrons. An experienced staff of engineers and electricians will take charge of and care for machinery exhibits, electrical appliances, etc.

THE WALKER COMPANY has recently issued seven circulars, numbered from 1080 to 1086, both inclusive. The subjects of these circulars, taken in their numerical order, are type "S" solenoid blow-out controllers, steel lighting generators, electric railway generators, the Love underground conduit, alternating current apparatus, Walker car motors for street lines, elevated or suburban traffic, and "boosters."

THE CUTLER-HAMMER MANUFACTURING COMPANY, of Chicago, reports that its sales for the month of August were much larger than for any preceding month in the history of that company. This certainly indicates an increase in the business of the motor manufacturers to whom most of this company's goods are sold. The Cutler-Hammer Company is preparing for a large fall business, and is constantly increasing its facilities for its rapidly increasing orders, so that they may be gotten out in the usual prompt manner.

THE WESTINGHOUSE NO. 49 MOTORS seem to meet with success, judging from a recent letter written by Mr. Horace E. Andrews, president of the Elevated Electric Railway Company, Cleveland, Ohio, to the Westinghouse Electric & Manufacturing Company, Pittsburg. Mr. Andrews states that his company is delighted with the operation of the No. 49 motors, and is having better success with them than with any other motor it has ever operated. This motor, it should be stated, embodies all of the best features of previous types of Westinghouse motors, which have an established reputation throughout the world for excellence.

THE GENERAL ELECTRIC COMPANY AT OMAHA.—For distribution at the Trans-Mississippi Exposition at Omaha the General Electric Company issued from its press a neat little brochure, very fully illustrated. As all the machinery used to light the grounds and buildings of the exposition and to supply the power was furnished by the General Electric Company, the types of apparatus shown in the book enable the visitor readily to identify each type as he meets with it in the exhibit or in any part of the working plant itself. Many thousands of these little books have been printed, and the demand for them at the exhibition has kept the company's presses fully occupied.

THE WARREN-MEDBERY COMPANY, Sandy Hill, N. Y., manufacturer of inductor alternators, reports a very large increase in sales for the month of August. Among its sales are the following named: Two in Canada, two in New York, one in San Francisco, one in Manitoba, three in Pennsylvania, one in New Jersey, two in New England, three in Texas, one in South Carolina and one in Tennessee. The sales of this company are said to be increasing rapidly, which would seem to indicate that the popularity of its machines is greater than ever. These alternators are reported to be rapidly growing in favor with engineers and station superintendents.

THE LUDEWIG-THURBER MANUFACTURING COMPANY, Pittsburg, Pa., which does business in repair work and the sale of electric light and power apparatus, reports such an increase of business as to warrant its moving into larger and more commodious quarters. The new shops will be more fully equipped to handle the large amount of electrical repair work, especially in armature and field winding, refilling of commutators, etc. The reasonable prices charged by this company for the excellent class of work turned out is the secret of its rapidly increasing business. The officers of the company are Mr. J. Ludewig, president; Mr. William Ludewig, vice-president; Mr. J. M. McGinley, general manager, and Mr. G. P. Thurber, secretary and treasurer.

THE HARRISON SAFETY BOILER WORKS, Philadelphia, Pa., reports a long list of recent sales of Cochrane separators and Cochrane feed water heaters and purifiers. Among the sales of separators we find the following: Warren Electric Light Company, Warren, Pa., one 6-inch horizontal separator; University of Kansas, Lawrence, Kan., 3-inch and 5-inch horizontal separators; the Homestead & Hilands Street Railway Company, Pittsburg, Pa., one 5-inch vertical separator; Harrisburg Foundry & Machine Company, Harrisburg, Pa., one 6-inch vertical separator, besides orders from Russia and South Africa. Among the sales of feed water heaters are the following: The Electric Storage Battery Company, Philadelphia, 500 horse-power; St. Louis Car Company, St. Louis, Mo., 500 horse-power, and Westinghouse, Church, Kerr & Co., Chicago, 100 horse-power.

WESTINGHOUSE DAY.—During the seventeenth annual convention of the National Association of Stationary Engineers, which was held in Pittsburg on September 5, 6, 7, 8, 9 and 10, one day—September 7—was set apart for a visit to the works of the various Westinghouse companies. This day was distinguished from the others by being called "Westinghouse Day." In the afternoon the delegates and friends, to the number of 600, visited the works of the Westinghouse Electric & Manufacturing Company and the Westinghouse Machine Company. Their train was drawn over the Turtle Creek Valley branch of the Pennsylvania Railroad to the Westinghouse Company's shops at East Pittsburg by a Westinghouse-Baldwin electric locomotive. After the shops were inspected a banquet was tendered to the visitors by the Westinghouse Machine Company, over 700 persons participating. The party were the guests of the Westinghouse Machine Company and Westinghouse, Church, Kerr & Co.

THE WESTERN ELECTRIC COMPANY has recently issued Bulletin No. 7-RS, giving detailed description of the Russell & Officer automatic switch. The object of this switch is to allow the turning on or off of one or any number of lights from two or more points by means of push buttons. Its advantages are that a large number of lights can be controlled by means of a push-button switch without having to bring the main wire supplying these lights to the switch itself, a No. 16 B. & S. gauge wire answering the purpose of any size of switch; that a group of lights may be controlled from any number of points independently of each other, and that lights in large rooms or buildings may be controlled from a central point. This switch is also designed as an underload or overload switch when provided with a special relay. The magnets operating the switch depend upon the electric light circuit, and there are no batteries to get out of order or cause trouble. This switch is manufactured by the Western Electric Company, and further details can be obtained by writing for a copy of Bulletin 7-RS.

RUSHED WITH GOVERNMENT WORK.—Mr. Campbell Scott, general sales agent of the C & C Electric Company, New York, states that his company is securing its full share of government orders for electrical apparatus. From the list of such sales the following may be mentioned: The lighting and power plant at Fort Delaware, Pa., including one 100-hp boiler, two 9x10 Ames engines and all the usual accessories, two 20-kw direct-connected generators, one switchboard, one electric blower combination and one 2-hp motor. This plant, it is stated, was promptly accepted by the authorities, and is giving the utmost satisfaction. For the Pittsburg post office plant the C & C Company supplied three 30-kw direct-connected generators. A duplicate of this plant is on order for the Louisville post office. For the Washington Navy Yard the company recently shipped nine closed-type ironclad motors, aggregating over 55 horsepower in capacity. The motors are for direct connection to wood-working machinery, and most of them were designed to run at very slow speeds. Ironclad motors of a capacity of 40 horse-power have also been supplied to the Brooklyn Navy Yard. The company has just shipped closed-type ironclad motors for operating ammunition lifts at the fortifications at the following named places: Great Gull Island, for 5-hp motors; Pensacola, Fla., two 5-hp motors, and Wilmington, Del., two 7½-hp motors. An order was received a few days ago for two generating plants for Fort Pickens, near Pensacola, Fla., each plant consisting of a 15-kw dynamo direct connected to a Case engine, and a switchboard. Besides the orders above mentioned the company has received others from different departments of the government for single machines and switchboards. The C & C Company continues to run its factory night and day, as it has for the past year.

ANOTHER LONG DISTANCE TRANSMISSION PLANT.—Contracts involving 10,000 horse-power are not common. Especially is this true when the agreement is to transmit this enormous amount of power over a distance of 45 miles. And when the contract further stipulates that the losses in generators, transformers and line shall remain normal, notwithstanding the difficulties involved, the agreement then becomes of still greater interest. Such a contract has just been executed by the Westinghouse Electric & Manufacturing Company, in which it agrees to comply with the above conditions. The plant is for the Snoqualmie Falls Electric Power Company, of Snoqualmie Falls, Wash. The power station is to be located at Snoqualmie Falls, 45 miles from Tacoma and 31 miles from Seattle, to which places the current is to be transmitted and then utilized by Westinghouse motors. The contract involves the building and delivery, at the above-named points, of four three-phase, rotary armature generators, having a normal aggregate capacity of 6000 kilowatts, and which are to be direct connected to water wheels; two 75-kw kodak exciter dynamos, also to be direct connected to water wheels; high and low potential switchboards, for main power station and sub-stations at Seattle and Tacoma, involving seventy-six marble panels with all necessary instruments, switches, etc.; high tension oil insulated static transformers, having an aggregate capacity of 10,875 kilowatts; rotary transformers with a total output of 2700 kilowatts and six type "C" motors developing 1600 horse-power, with adequate lightning protection at both ends of the line. These machines when installed will make available for industrial, railway and lighting purposes the power of Snoqualmie Falls. The line potential will be 25,000 volts, and its current will be carried over bare aluminum wires to sub-stations, where lowering transformers will sufficiently reduce the voltage for safe transmission within the corporate limits of the two cities.

Business Notice.

THE ILLUSTRATIONS in this issue were made by the Photo-Engraving Company, 9-15 Murray Street, New York City.

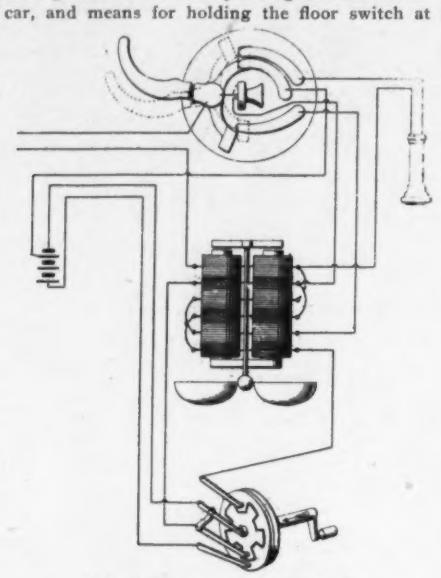
ILLUSTRATED RECORD OF ELECTRICAL PATENTS

UNITED STATES PATENTS ISSUED SEPTEMBER 6, 1898.

[In charge of Wm. A. Rosenbaum, 177 Times Building, New York.]

610,190. SECONDARY BATTERY; G. J. Miller, of Kenton, Ohio. App. filed April 13, 1897. In a secondary battery, the combination of an insulating box, positive and negative electrodes within said box, composed of active materials mounted within and conductive connection to a perforated metallic lead case, a surrounding space between said active material and surrounding case except where attached, means for preserving said space, and means for connecting conducting feed and discharge wires, substantially as described.

610,197. CONTROLLING DEVICE FOR ELECTRIC ELEVATORS; N. P. Otis and R. C. Smith, of Yonkers, N. Y. App. filed April 4, 1892. The combination with an elevator car and starting mechanism, of a floor switch governing the circuit for operating the mechanism to elevate and lower the car, and means for holding the floor switch at an intermediate position with the circuits broken when the car is opposite a landing, substantially as described.

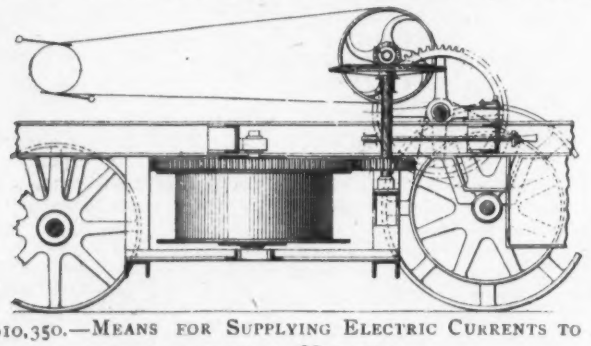


No. 610,347.—TELEPHONE.

610,241. COLLECTOR FOR ELECTRIC RAILROADS; F. S. Pierson, of Boston, Mass. App. filed March 31, 1897. In a collector for electric railroads, in combination, a contact plate arranged and adapted to convey the electricity from the collector; and an ice dissolving material carried by the plate whereby the ice is removed from the conductor, substantially as described.

610,274. TELAUTOGRAPH; L. O. McPherson, of Highland Park, Ill. App. filed March 13, 1897. In a telautographic system, a receiving pen, electrically operated devices for controlling the extent and direction of the movements of progression thereof, a commutator for controlling the circuit of said devices, and means actuated by the shifting of the paper for actuating said commutator.

610,278. TELEGRAM TRANSMITTER; E. Porter, of Sydney, N. S. Wales. App. filed Sept. 4, 1897. In a telegram transmitter, the combination with a slidable key having a code plate; of a slid having an operative connection with said code plate during its downward movement; a circuit make and break device operated by said slide; a slidably mounted stop plate having a contact with said plate upon the return movement of said key, said stop plate serving to retain said slide in a fixed inoperative position, and means, connected with said key, for moving said stop plate at the end of movement of said key.



No. 610,350.—MEANS FOR SUPPLYING ELECTRIC CURRENTS TO AGRICULTURAL MACHINES.

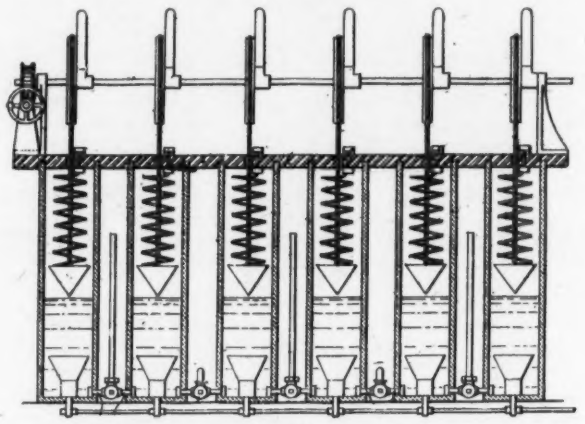
610,347. TELEPHONE; W. A. Drysdale, of Philadelphia, Pa. App. filed Sept. 17, 1897. In a telephone station, the combination with a pivoted transmitter casing, of an automatic switch mounted within said casing, a receiver supporting arm upon said switch extending through said casing, an oscillatory hook upon said arm, and wiring connections for said transmitter and switch within said pivoted casing.

610,350. MEANS FOR SUPPLYING ELECTRIC CURRENTS TO AGRICULTURAL MACHINES; H. Foerster, of Gorsdorf, Germany. App. filed Jan. 8, 1898. In a system of electric supply for electromotors of agricultural machines, the combination with a plow and its draft-rope, of a primary generating dynamo, and two electromotors for operating the plow or other machine, which electromotors are connected by a single line wire with the dynamo, and which are placed in electrical connection with each other by the draft rope of the plow.

610,393. TELEPHONE; S. S. Fisher, of San Francisco, Cal. App. filed Jan. 14, 1897. In a telephone system, two stations connected by a line wire whose ends are in electrical connection with switch points, each station having a grounded instrument circuit terminating in a contact point, a grounded signaling circuit terminating in a contact point and embracing a main battery, and a relay wound to a resistance adapted to the line-wire circuit, a local circuit embracing a contact point, the armature of the relay, a local battery and a signal, and a normally open ringing-up circuit leading from the grounded signaling circuit, terminating in a contact point and containing a circuit closer, the three contact points of the instrument, signaling and ringing-up circuits lying within the path of movement of the switch points.

610,402. ELECTRIC SWITCH; R. L. L. Hundhausen, of Wilmersdorf, Germany. App. filed Dec. 31, 1897. In an electric switch, the combination with a movable contact part, of a second contact part with which it is adapted to engage, the relatively movable actuating part having an inclined face, the coacting roller engaging said face and a spring associated with said movable contact part and adapted to secure its sudden engagement with and its disengagement from the second contact part, substantially as described.

610,406. RESISTANCE AND CONTACT APPARATUS FOR ELECTRIC CURRENTS; H. Lyon, of Glasgow, Scotland. App. filed July 6, 1898. In electric contact and resistance apparatus, combining two jars partly filled with a resistance liquid, and having at the bottom metal cups connected to a main conductor, with two cones, one in each jar, suspended from opposite sides of a pulley, the turning of which raises one cone and lowers the other, the cones being connected by wire coils to separate conductors, substantially as described.



No. 610,406.—RESISTANCE AND CONTACT APPARATUS FOR ELECTRIC CURRENTS.

610,413. DIRECT CURRENT REGULATOR; F. H. Ramsay, of Walsenburg, Col. App. filed Jan. 28, 1898. In a portable direct current regulator, the combination with a pair of insulating disks, and a socket and tap extending oppositely from said discs, of a resistance circuit spirally arranged upon one of the discs, a series of contact plates, constituting portions of the resistance circuit, one of said plates being in direct electrical connection with one of the terminals of the socket, and a longitudinally movable switch rod in electrical connection with one of the terminals of the tap and designed to make electrical connection with either of the contact plates in the resistance circuit.

610,445. ELECTRIC RAILROAD; J. C. Henry, of Denver, Col. App. filed June 30, 1898. In an electric car having the controllers located on the platform and having removable handles capable of connection with said controllers, so that they may be conveniently manipulated from either the inside or outside of the car.

610,509. MEANS FOR CONTROLLING VOLTAGE AND VOLUME OF ELECTRICAL CURRENTS; H. Williams, of Cleveland, Ohio. App. filed Dec. 8, 1897. In an electrical apparatus, a series of cells and resistances interposed between the cells and a line of separate resistances in the circuit beyond the cells, and a switch constructed and arranged to first travel over said cells, and lastly over the outside resistances, substantially as described.